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Quality Aspects of Egg Marketing

N. R. KNOWLES, PH.D.

Technical Manager, British Egg Marketing Board

Producers, packers and distributors must all play their parts efficiently if eggs are to reach the housewife in good condition. This article deals briefly with the various quality factors which are important in connection with successful egg marketing

IN the United Kingdom at the present time, some 145 million home-produced, shell eggs are being marketed each week by the British Egg Marketing Board. It stands to the credit of the Board, and to previous marketing organizations that the great majority of such eggs are reaching the consumer as sound, good quality eggs. Nevertheless, during the latter summer months there have been isolated instances of inferior quality eggs reaching the public, particularly in the south-eastern parts of England. Since the Board started marketing operations on July 1, and up to the end of September, sixty-five individual complaints were received, and of these, forty-three were in respect of eggs delivered to the south-eastern regions. The complaints, whilst being comparatively few in terms of the actual throughput of shell eggs, do indicate that there is a possibility of a weak link in the structure of our present marketing scheme.

A study of the complaints received and investigated by the Board during the period July to September have indicated two main types of quality deterioration in eggs reaching consumers. The majority of complaints were in respect of stale eggs, a fact which would suggest that some eggs were being held too long, and probably at too high a temperature, before being used by the consumer. It is interesting that this idea is, in part, confirmed by the Meteorological Office records, which showed that temperatures in south-eastern districts were higher than those elsewhere in the United Kingdom during the period in question. A smaller number of complaints were also received from consumers about eggs in which there were signs of microbial deterioration, a fact which would seem to indicate improper production methods on the farms supplying the eggs.

The aim is first-quality eggs

Arrangements for marketing in this country are designed to ensure that only first-quality eggs reach the consuming public. Briefly, the marketing system involves the collection of eggs, weekly, from producers' farms, and their transport to neighbouring packing stations to undergo a candling examination for quality, followed by a grading operation during which they are segregated into five separate weight grades. The object of the candling examination is to eliminate faulty eggs and ensure that only first-quality eggs are selected for consumer channels. The operations of all packing stations

are under the supervision of the Board's technical officers, who make sure that the correct standards of quality are being observed. Examinations carried out in this manner at packing stations are an essential part of the marketing organization, since by reason of various physical imperfections, not all eggs are laid as first-quality specimens. Normally, the packing station examination may take from one to two days, after which the eggs are forwarded to various distributive channels. From then, the time taken for eggs to reach consumers will vary according to the distributive route through which the eggs pass and, of course, upon the demand which exists at that particular period, but it is conceivable that under the best conditions, many eggs will be only five to ten days old when they reach the consuming public.

In reality, the basic factors affecting the quality of shell eggs are comparatively simple and straightforward. Eggs are perishable, and it must be realized that from the moment of laying they begin to deteriorate. The rate of deterioration, in common with many other foodstuffs, is influenced to a very great extent by holding temperatures and methods of handling. Furthermore, the quality of all freshly-laid eggs is not completely uniform, and as a possible consequence, deterioration rates may also differ, even under conditions which are relatively similar. Whilst eggs are well able to withstand normal conditions of handling, they are essentially fragile, and improper methods can easily result in a high proportion of cracking or physical changes in the quality of the contents.

These then are the fundamental quality concepts which producers, packers and distributors must bear in mind to make egg marketing completely successful and to eliminate any danger of complaints from consumer sources. It would not, therefore, be out of place in this article to indicate briefly the contributions that the various sections of the industry can make towards establishing satisfactory quality in eggs reaching consumers.

Producers—the first link in the chain

The egg producer is the first link in the marketing chain, and any fault in eggs coming from his holding, apart from those capable of being removed at the packing station, will naturally be carried through to distributive and consuming circles. In all probability such faults will be seriously intensified as the age of the egg increases. A great deal can be done by producers to achieve all-round, satisfactory quality, if strict attention is paid to the following points:

(a) Naturally clean eggs possess inherent, good-keeping quality properties and can be relied upon to remain basically sound for appreciable periods under normal conditions of handling. In the interests of quality, therefore, and in their own financial interests as well, producers should try to produce as many naturally clean eggs as possible. In part, this can be achieved by paying attention to such items as more frequent collection of eggs from nests, and improving the cleanliness of nest-boxes and nesting materials and of approaches to the laying sections. Investigations carried out on this aspect of quality improvement have shown quite definitely that it is possible to effect a substantial increase in the number of clean eggs by incorporating these points in the management system.

(b) It is realized that even under the most satisfactory conditions of management, a number of soiled eggs will be collected daily; they should be separated from the others for cleaning by an *approved* method. Experience over many years has shown that washing is one of the most important factors influencing spoilage in shell eggs. The actual mechanism of washing soiled eggs allows spoilage organisms to gain access to the egg contents via numerous microscopic pores found in the shell. These organisms are normally found in soil and faeces and, of course, are associated with the shell of soiled eggs. When they are able to gain access to the egg contents they will, under conditions suitable for growth and development, cause forms of rotting, such as green, sour or mould rots, within the egg. Frequently, the washing of soiled eggs can give rise to a specific form of spoilage known as "green-rotting", the characteristics of which are the development of an unpleasant, fusty odour in the egg, and a pronounced, green fluorescent colour in the white. In view of this danger, producers should not wash their eggs.
(c) An alternative method of dealing with soiled eggs, which will have very little effect on quality, is dry-cleaning. Eggs may be cleaned by hand, using fine-grade steel wool (grade 0) or stiff brushes, or by means of a power-operated buffing machine in which cleaning is effected by holding the egg lightly against a rapidly-rotating cloth disc. The method has very little effect on the shell of the egg and is recommended to all egg producers. An important point in connection with dry-cleaning methods is that stains on the shell are removed and the egg given a polished, yet not unattractive appearance.
(d) The temperature at which eggs are kept has a very important bearing on their quality, and producers should try to hold their egg supplies under as cool conditions as circumstances permit. Eggs should also be cooled before being packed into cases; this can be done by placing them broad end up in Keyes trays before putting them in collection boxes. In all instances, eggs should be handled carefully with *clean* hands. Visibly cracked eggs should be packed separately. Under no circumstance should eggs be exposed to the sun's heat; in fact they should be kept in a cool, clean, shady room whilst awaiting collection. It must be remembered that eggs can become tainted if their storage place is also used to house such things as stocks of paraffin, paint and disinfectants.
(e) Producers can do much to obtain first-quality eggs by trying to eliminate fertile eggs from their supplies. This can be achieved by removing male birds from laying flocks immediately after the breeding season.

Packing stations

Although packing station operations can do little to effect any general improvement in the quality of eggs from producers, they can make certain that the eggs do not suffer any additional deterioration, and can make sure that any defective eggs are removed from first-quality grades. If the required standards of quality grading are not adhered to in packing stations, there is a great danger that some eggs of poor quality may not be noticed and so give rise to complaints from the public. The passage of eggs through packing stations should be carried out as quickly as is consistent with quality

grading, and at all times due consideration should be given to the question of holding the eggs under cool conditions.

Distribution

As with the packing station, little can be done during distribution to improve the original quality of eggs, but conversely, a great deal of harm can be brought about if conditions of distribution are not consistent with those of quality handling. The two vital factors during distribution are those involving the time and temperature of holding. Failure to observe the importance and significance of one or other of these factors can result either in stale eggs, or, in some instances, eggs showing signs of microbial deterioration. Generally speaking, stale eggs may occur when eggs have been held too long, often in warm weather, and to some extent, the presence of stale eggs tends to suggest that the methods of distribution have been the prime cause of trouble. Where eggs show signs of microbial decomposition, the trouble can frequently be traced back to the practice of washing soiled eggs on the farm.

The housewife does not want stale eggs; the yolks are soft, flattened and break easily, and there is considerable thinning of the thick white, with the result that the albumen spreads in a rather watery manner. One or two poor quality eggs may undeservedly set a reputation for all eggs and so reduce the demand for this very important article of food. If, as sometimes happens, staleness is accompanied by an unusual odour and flavour, the egg is normally thought to be "going off", and the complaint will most certainly evoke a greater degree of indignation. Although consumers themselves may be partly to blame in helping staleness to develop in eggs—for example, by over-buying at any one time and keeping the eggs in a warm place, it is equally certain that the practice of holding trays of eggs in shop windows, often in the full rays of the sun, will do much to accentuate staleness.

This, in general terms, is a *résumé* of egg marketing conditions in the United Kingdom, together with a review of the more important factors which have an effect on the ultimate quality of eggs reaching the consumer. As can be readily appreciated, co-operation between producer, packer and distributor, must form an integral part of the quality control function of the organization to ensure that weak links do not develop in the structure of the scheme. It is necessary that each party in the egg industry should recognize each other's problems and attempt to provide the conditions that are necessary for the maintenance of quality at the highest possible level.

Oxford Farming Conference, 1958

The twelfth Oxford Farming Conference will be held January 6–8 at the Playhouse, Beaumont Street, Oxford. All interested in agriculture will be welcome, but tickets should be obtained beforehand from the Honorary Secretary, Department of Agriculture, Parks Road, Oxford.

The theme of the Conference will be the national need for increased self-sufficiency.

Milk Substitutes and Early Weaning of Calves

T. R. PRESTON, B.SC., PH.D.

The Rowett Research Institute

In an experiment at the Rowett Research Institute, Ayrshire calves, reared according to an early-weaning and dry-feeding plan, made satisfactory growth when reconstituted skim milk or reconstituted buttermilk were fed in place of whole milk.

SINCE the advent of early weaning and dry feeding as a system of rearing calves, there would appear to be very little need for liquid cow's milk substitutes. To some extent this is true, for with the current method of early weaning calves as practised at this Institute,[1] each animal is fed only 10 gallons of whole milk. Most rearers would be prepared to feed this small quantity, since on most dairy farms there is a certain amount of unsaleable milk either from newly-calved cows or from those with mild infections. Moreover, the lower incidence of scouring, the better growth rate in the first three weeks and the convenience of not having to buy and use milk substitutes are usually a sufficient recompense for the slightly extra cost of the cow's milk. But despite these factors, there are some dairymen who want to sell every gallon of whole milk, and there are, too, very many farmers who wish to rear calves for beef production without having the trouble of maintaining cows. These farmers still require some form of liquid cow's milk substitute which will take their calves to the stage when they can depend entirely on dry feed.

To discuss adequately the factors which must be considered in formulating a cow's milk substitute, it is necessary to explain certain aspects of the digestive system of the young calf. For all practical purposes the calf can be thought of as having two stomachs, the first stomach—the rumen or paunch—then the true stomach or abomasum which is synonymous with the stomach in monogastric mammals like the pig and the rat. Solid foods, for example hay and concentrates, pass into the rumen first and there they are fermented and mainly digested by bacteria and other micro-organisms. But liquid foods such as milk and milk substitutes by-pass the rumen via the oesophageal groove. This channel is formed by the lips of the rumen under a stimulus elicited probably by the presence of liquid in the back of the calf's mouth. Such liquid foods pass directly into the abomasum and from there to the small intestine, where they are digested by enzymes in the gastric juices secreted from glands leading into these parts of the digestive tract. Efficient utilization of a liquid food depends, therefore, on whether the animal secretes the appropriate enzymes to digest the components of that food. In other words, one can include in a milk substitute only those ingredients for which the calf possesses the corresponding enzymes.

It is axiomatic that the calf has enzymes capable of hydrolysing lactose,

casein and butter fat, since these are the principal constituents in whole milk. But there is very little evidence concerning the activity of other enzymes in the digestive tract of the young calf, and much of what is known is circumstantial and has resulted indirectly from feeding trials.

Carbohydrates

The best picture of the value of different carbohydrates for the young calf is shown by the work of Dollar and Porter.[2] These workers fed various solutions of carbohydrates to calves, and then measured the concentration of glucose in the blood on the understanding that digestion of a particular carbohydrate would be manifested, within an hour or so of feeding, in an increase in the concentration of blood glucose. Their results showed that while the feeding of lactose and glucose to the week-old calf produced a rapid rise in blood glucose, maltose and cane sugar had only a very slight effect, and dextrin and starch had none. Dollar and Porter claimed from additional unpublished work that these findings were corroborated by studies of enzyme activity in the gut which indicated a high activity of lactase at birth, but negligible activity of the starch-splitting enzyme amylase, sucrase and maltase, and that the hydrolysing power of these latter enzymes did not become appreciable until the calf reached 4–6 weeks old.

The implication of this work is that the only carbohydrates suitable for inclusion in a milk substitute are lactose and glucose. Starch, the cheapest and most commonly used source of energy in our livestock feeds, cannot be utilized by the young calf. In fact, its presence in any appreciable amount in a milk substitute is something of a liability, since it passes down the gut undigested, forms a source of food for bacteria normally resident in the bowel, and the resultant increased bacterial activity is frequently the cause of scour.[3]

Protein and fat

In its first week of life the calf is dependent on rennet for the initial stages of protein digestion,[4] and since this enzyme is specific for casein (the chief protein in milk), there is little to be gained in considering alternative sources of protein. An illustration of this is the very poor growth rates and low digestibility co-efficients for protein which resulted when calves under four weeks old were fed a synthetic milk diet in which the source of protein was soyabean flour.[5, 6]

It is relatively simple to find a cheaper source of fat than butter fat for inclusion in milk substitutes; both lard and margarine have been used successfully for this purpose. The difficulty is that such fats must first be emulsified and then homogenized into the milk, because the diameter of the fat globules must be reduced before the calf can utilize them.[4] Homogenizing can be done only when the milk is reconstituted with water and, as the necessary equipment is not available on the ordinary farm, addition of fat to a milk substitute is not practicable.

On the basis of our present knowledge of the requirements of calves one to four weeks old, it would appear that the only nutrients which are utilized efficiently when incorporated in a liquid diet are lactose, glucose, casein and

butter fat. With the exception of glucose, these ingredients can be obtained only from milk or from the by-products of the milk manufacturing industry—dried skim milk, dried buttermilk and dried whey. In effect, these products, together with glucose, are the only suitable ones for compounding into a milk substitute.

It is apparent from analyses—see Table 1—that dried skim milk and dried buttermilk contain rather too much protein in relation to their energy value, while whey has too little. Whey, in particular, is very acid and, because of its high lactose content, is likely to cause scouring.[7]

Table 1

Composition of whole milk and milk by-products

	Dry matter composition (per cent)				
	Protein	Lactose	Fat	Ash	S.E.
Whole milk . .	22·6	37·6	30·5	5·5	134
Buttermilk . .	39·1	44·5	8·7	7·7	100
Skim milk . .	37·3	53·2	1·1	8·5	88
Whey . . .	10·7	75·7	3·0	10·7	92

The most suitable analysis is obtained from a combination of all these milk products, and many proprietary milk substitutes are compounded in this way. But for the average farmer, who uses only small quantities of milk substitute, it would be much simpler if he could use one of these milk products singly without having the trouble of mixing.

We decided, therefore, to investigate the value of reconstituted dried skim milk and reconstituted dried buttermilk as substitutes for whole milk during the liquid feeding phase, from four- to twenty-days old, of calves reared according to an early weaning plan.

Feeding trials

Twenty-four Ayrshire calves were fed colostrum for three days and then allocated to three groups. Calves in group A were fed whole milk at the daily rate of 9 per cent of birth weight; those in groups B and C were fed, respectively, reconstituted dried buttermilk (roller-dried) and reconstituted dried skim milk (roller-dried) at a rate sufficient to supply the same amount of energy as was in the whole milk fed to group A. The dried milk products were reconstituted by mixing the dry powder with eight times its weight of warm water; 55 mg chlortetracycline (as Aurofac D) was added daily to the milk for each calf. Feeding was twice daily. The calves were offered, *ad lib.*, hay and water at one week old, and one of the meal mixtures shown in Table 2 at two weeks old. The two mixtures were allocated equally amongst the calves in each group.

At three weeks old, the calves were weaned abruptly, and from this stage increasing quantities of meal were fed until the calves were consuming the maximum allowance of 4½ lb per head per day.

There was a high incidence of scouring and two deaths in the first few calves allocated to the skim milk and buttermilk treatments, probably as a result of attempting to achieve, too early in life, the same energy intake as

Table 2

Composition of meal mixtures (lb)

	Mixture A	Mixture B
Flaked maize	196	224
Bruised oats	168	168
Molassine meal	84	84
Dried skim milk	56	—
Decorticated extracted groundnut meal	56	84
Stabilized vitamins A and D	2·5	2·5
Proprietary aureomycin supplement (3·6 g aureomycin per lb)	1·25	1·25
Salt	3	3
Steamed bonemeal	3	3
Limestone flour	3	3

those calves fed whole milk. At the theoretical rate, the calves which were fed the milk substitutes were receiving almost twice as much casein as those fed with whole milk, and this over-feeding of protein may have caused indigestion and consequent diarrhoea. The remaining calves allotted to the experiment were taken up to their maximum allowance of milk substitute gradually over a period of ten days, and this helped to reduce the incidence of scouring considerably.

Despite the higher incidence of scouring in the calves fed skim milk and buttermilk, the growth rates, food consumptions and meal conversion rates were very similar for the three groups, as will be seen from Table 3. The

Table 3

Average growth rates, food consumptions and feeding costs to 12-weeks-old for Ayrshire calves fed whole milk, reconstituted dried buttermilk and reconstituted dried skim milk.

	WHOLE MILK	BUTTERMILK	SKIM MILK
Number of calves	7	7	7
Daily liveweight gain (lb/day)	1·04	1·01	1·07
Daily increase in height at withers (mm/day)	0·13	0·12	0·12
Milk consumption (lb)	102	15	19
Meal consumption (lb)	195	204	208
Hay consumption (lb)	27	27	27
Meal conversion rate (lb meal/lb gain)	2·25	2·42	2·32
*Feed cost (shillings)	90·8	73·5	78·5
Cost per lb gain (shillings)	1·04	0·87	0·87

* Whole milk 3s. per gal; Dried skim milk 85s. per cwt; Dried buttermilk 75s. per cwt; Mixture A 36s. per cwt; Mixture B 31s. per cwt; Hay 10s. per cwt

only advantage shown by those fed whole milk was that they required less meal per unit of liveweight gain, thus suggesting that the whole milk was more efficiently utilized than either the buttermilk or the skim milk. The average growth rate of 1 lb a day is satisfactory for Ayrshires, particularly in view of the very low feeding cost.

The results of this experiment would seem to indicate that calves can be reared according to an early-weaning and dry-feeding plan without the use

of any saleable whole milk. But in making practical recommendations, it would seem wise to feed rather less milk substitute than the daily amounts used in this experiment. In fact, a maximum of ¾ lb of the dried powder daily reconstituted with 5–6 pints of warm water has since proved a more satisfactory level of feeding.

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In Time of Farrowing

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To get the best and most profitable litters, careful attention must be paid to the feeding and management of the breeding stock, with the general aim of maintaining them in good but hard condition.

THE title of this article might suggest that at the farrowing period there is worry and stress for all concerned, but in fact, given proper management, the sow is normally one of the least troublesome of farm livestock at this time. The purpose of this article is to discuss some of the more important aspects of the management and feeding of the breeding pig which help to ensure trouble-free farrowing of large litters of thrifty and profitable pigs.

First, a word of caution is necessary. It is, unfortunately, a fact that many of the practical recommendations required by the pig-farmer concerning his breeding stock must still be based on empirical, rather than on sound, scientific considerations. Much research is needed before a full understanding of the many factors affecting reproduction in the sow is obtained, and in the absence of full scientific information on the subject, it is sound policy to over- rather than under-provide for her in both management and nutrition. Such a policy is followed in the recommendations made throughout this article.

The breeding stock form the foundation of all pig-production, and unlike

bacon and pork pigs, usually remain on the farm for several years. Thus the long-term effects of the treatment they receive are vitally important. It is easy to save shillings on the food bill, but, if the result of doing so is one fewer piglet born or an extra one lost before weaning, the ultimate loss of profit can be counted in pounds not shillings.

Preparing the breeding stock

A word on the selection of young gilts—in commercial herds they are frequently taken from pens of bacon pigs approaching slaughter weight. This is not an ideal practice because usually such pigs will not have had enough exercise, but if this fault is remedied immediately, no lasting harm appears to be done. Today, many of these gilts will have been fed antibiotics; however, most of the evidence now available indicates that there is no harm in feeding antibiotics to breeding pigs, but as beneficial effects rarely occur, it is not economic to do so. Therefore, it is unlikely that there will be any lasting ill-effects when the antibiotic is withdrawn from the young gilt's diet, although in some cases there may be a brief set-back in growth.

It is an old adage that all breeding pigs should be kept in good, hard condition, fit but not fat; certainly such treatment is one of the secrets of success and can best be provided by an outdoor life with plenty of exercise. Sufficient paddocks to permit rotational grazing are essential to get the best value from the pasture and to maintain the sward; 2–3-year leys are recommended and useful information about seeds mixtures for such leys is given by Eyles and Alder.* Electric fencing is useful, provided the pigs are ringed and enticed to touch the wire with the ring when they are first put inside the fence; its use is not, however, advised for empty females because, when in heat, they will most likely break through the fence with impunity.

Gilts should not be served until eight to nine months old. If they are served before this age, smaller litters are likely, since fewer eggs are shed at the earlier heat periods. Sows should be served at the first heat, which normally occurs within a week of weaning. If this is missed, trouble is often experienced in getting them to hold at subsequent heats. Individual service is recommended so that exact records of farrowing dates can be kept and the risk of the boar being over-used avoided. Time of service is vitally important; it is now known that the eggs shed from the ovaries at oestrus enter the uterus more quickly than was once thought, and undoubtedly, service too late in the heat period is a frequent cause of failure to hold, or of small litters. It is of interest that faulty timing of inseminations is now recognized as being one of the major problems in artificial insemination work with pigs. Evidence for advantages in two services is accumulating, and ideally, the aim should be to serve a sow, first observed to be well in season at the morning feed, last thing the same day and again early the following day. If heat is not observed until later in the day, the sow may be served in the morning and late afternoon on the following day. One final comment on service—let the boar decide when it is completed.

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* Herbage Species and their Management for Pig Pastures. D. E. Eyles and F. E. Alder. *Pig Breeders' Gazette*, 1956, **86**, 53.

Farrowing

The pregnant animal should be brought into the farrowing quarters a fortnight before it is due to farrow so that time is allowed for settling down and for the necessary special feeding to be given. A useful guide to the time when the sow should be brought in, is 14 weeks after successful service.

Indoor farrowing pens are most commonly used and, taking everything into consideration, are probably the most suitable, although many farmers use outdoor units successfully. Farrowing crates, or permanent pens constructed on the pattern of such crates, have much to recommend them as a means of reducing piglet losses. A warm, dry bed for the sow is essential; wheat straw is the best type of bedding.

It will generally pay to try to attend all farrowings; not many pigs need to be saved to more than pay for the extra labour involved. At the very least, attend all gilts, and sows known to be difficult at farrowing. Usually all that is required is to dry the piglets as they are born, and before placing them in a box under an infra-red lamp, cut off their eight tusk teeth (preferably out of earshot of the sow). After an hour or so, they may be put with the sow and assisted in their first efforts to suck. A normal farrowing may take anything from two to eight hours; if the afterbirth is not expelled shortly after this period, an obstruction should be suspected, as may also be the case if at any time during farrowing the sow strains for more than half-an-hour or so without a pig being born. Often the offending piglet can be removed quite easily with manual assistance, but this should be kept to a minimum because of the danger of setting up infections in the reproductive tract. If in doubt, call in the veterinary surgeon at once; delay may make it impossible for him to help and the sow may be lost.

While farrowing is in progress, a half to three-quarters of a pint of colostrum can usually be collected readily by hand-milking; any pig-keeper with access to a household deep-freeze would be well advised to maintain a supply of frozen colostrum which could be invaluable in starting off a litter of orphaned piglets.

Four to seven days after farrowing, or a little later in cold weather, the sow and litter should, wherever possible, be put out on pasture and kept there for the entire suckling period. Work at the National Institute for Research in Dairying, Shinfield, has shown that better results can generally be expected by rearing on pasture than on concrete. Fold-units, tethering, or small individual paddocks are all suitable for this purpose, provided the pigs are continually kept moving on to fresh ground.

The right level of nutrition

Adequate nutrition of the breeding pig is one of the major keys to success and its importance cannot be overstressed. Unfortunately, it is particularly in this field that much further research is required and empirical recommendations have so often to be made. For all classes of breeding stock on all meal feeding, a level of protein, equivalent to 10 per cent white fish meal, is recommended to ensure good results. In summer, when good grazing is available, the protein may be reduced to 5–7½ per cent. Protein supplements

other than fishmeal can be used, but at least half should be animal protein. Supplements of limestone and salt will usually be needed when fishmeal is replaced wholly, or in part, by other protein foods. Special trace mineral mixtures are valuable under certain limited conditions where known deficiencies exist, but for general use they are of doubtful economic value.

A synthetic vitamin A and D supplement should be added during the winter and, where good pasture is not available, during the summer also. Wide variations can be made in the cereal components of the ration according to availability and comparable cost, although a mixture of at least two cereals or cereal by-products is recommended.

Bulky carbohydrate foods such as potatoes and fodder-beet are useful for breeding stock, but for the best results they should be given in limited quantities, replacing a maximum of 2–3 lb of the meal ration, which must contain additional protein and minerals. Young pasture is also very valuable and allows a reduction to be made in the amount of concentrates fed. Preliminary results from recent work also indicate that the protein in the concentrate ration may be drastically reduced. However, further research is required before the precise value of pasture is established and, for the present, I would recommend that it is never regarded as replacing more than 2 lb per day of a meal containing a minimum of 5–7½ per cent white fishmeal or its equivalent. Where available, both whey and skim milk, particularly the latter, are valuable additions to the sow's diet.

The quantitative recommendations that follow for all-meal feeding refer to animals of average size and are given only as a guide. The pigman must continually watch the condition of his stock and change the level of feeding whenever necessary to prevent excessive fatness or poor condition.

It is now well established that too heavy feeding of gilts in the months before service results in an increase in foetal mortality and smaller litters. About 6 lb meal per day is normally adequate until about three weeks before service, when the daily ration should be raised to 7–8 lb. Flushing in this way increases the number of eggs released and the size of the litter eventually born.

Rations before and after farrowing

During gestation a gradually increasing level of feeding is advocated, a daily ration of 4–5 lb, 5–6 lb, 6–7 lb and 7–8 lb being given in the first, second, third and fourth months of pregnancy respectively. Four to five days before farrowing, however, the ration must be reduced to some 5–6 lb per day, as many of the troubles leading to failure of the milk supply after farrowing are thought to be associated with too heavy feeding at this time. Where groups of sows in different stages of pregnancy are run together, the above recommendations can only be followed if individual feeding is practised. When this very desirable feeding system is not used, the only alternative is to group-feed an average daily ration of 6–7 lb to all animals until they are brought in to farrow. In the days before and following farrowing, watch for signs of constipation in the sow. This is particularly likely to occur when she is first brought indoors from pasture. Daily exercise, some green food or the addition of 50 per cent bran or wheat offals to the ration for one or two feeds should put matters right.

Too heavy feeding in the first days after farrowing must also be avoided. Starting with 3–4 lb meal on the first day, the amount may be increased gradually until full rations, on the basis of 5 lb for the sow and ¾ lb for each piglet per day, are being fed by the end of the first week. This may be continued for the entire suckling period, but here again the skilled pigman will be ready to make adjustments according to the sow's condition.

A drastic drop to 3–4 lb meal per day when the pigs are weaned—whether this is at the customary eight weeks, or from ten to fourteen days onwards, as a number of people are doing now—should ensure that the sow dries off without trouble in a day or so. She should then be fed up to 8 lb per day during the few days remaining before being served again and returned to the in-pig sow paddocks. If, however, excessive loss of weight and general condition has occurred during lactation, she should continue to be kept on her own (unless individual feeding is practised in the sow paddocks) and fed up to 6–7 lb meal per day until her condition has improved.

An *ad lib.* supply of water for the breeding stock at all stages of pregnancy and lactation is absolutely essential and there can be no excuse for its omission.

One final word for those who appreciate an afternoon off now and again. Recent work at Shinfield indicates that, as with fattening pigs, one feed per week to the lactating sow may be omitted without harm, provided the food so lost is made up to her over the rest of the week.

Sheep or another Enterprise?

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The sheep enterprise must be seen against the farm organization as a whole. Hence the need to examine facts and figures carefully before putting "just an idea" into practice.

IN those parts of the country free from the menace of dogs and trespassers, farmers may be thinking of introducing a few sheep. It is generally agreed that sheep in small numbers are complementary to, rather than competitive with, cattle in their grazing demands; some would claim that the ratio of sheep to cattle can be varied a good deal before pastures deteriorate to an extent which would upset the relative profitableness of the two enterprises. Care must be taken, however, to ensure that the peak demand for grazing by the sheep, when the lambs are putting on weight, does not coincide with a period of grass shortage. In the case of understocked farms, there is no

doubt that a well-managed flock of sheep can make a valuable contribution to farm profits. In many other instances, a small flock can be kept simply by improving the management of the grassland. This is demonstrated in the following partial budget which is based on prevailing costs and prices in the South-West and shows that profits may be increased by as much as £8 per ewe.

Table 1

Introduction of 30 Longwool ewes to an understocked farm: replacement ewes bought*

133 per cent lambing

Extra Costs	£	Extra Output	£
12 two-tooth ewes @ £13†	156	10 shorn draft ewes @ £6	60
¼ cwt concentrates per ewe	26	Wool @ £3 per ewe‡	84
Ram depreciation	8	38 fat lambs @ £8	304
Sundry costs @ 12*s.* per ewe	18	(2 ewes, 2 lambs lost)	
Income lost	—	Costs saved	—
	208		448
Net Gain	240		

110 per cent lambing

Extra Costs (as above)	208	Extra Output	
		10 shorn draft ewes @ £6	60
		Wool @ £3 per ewe‡	84
		31 fat lambs @ £8	248
		(2 ewes, 2 lambs lost)	
Net Gain	184		392

* Devon Longwool and South Devons. † A well-established flock should have a lower replacement rate.
‡ Value of wool from half-bred or Clun type sheep about 28*s.* per ewe.

On many farms, however, sheep can be introduced only at the expense of some other form of production. This may involve the replacement of dairy cows or store cattle by sheep, or some adjustment in the cropping programme. This article is written mainly as a warning against making such major changes in farm organization without considering *all* the financial implications. For instance, the cost of keeping a cow for twelve months may be £100, but by no means all of this sum can be saved by reducing the size of the dairy herd by one cow.

Sheep or dairy cows?

Undoubtedly the change of enterprise most frequently considered is that from dairy cows to sheep. With only a token increase in the guaranteed price granted in the 1957 Price Review to cover higher costs, there is little doubt that prices have hardened against the milk producer. The position is complicated further by the steady increase in annual production, all of which is used for manufacture and thereby depressing the average realization price per gallon. However, despite the rather gloomy condition of the milk market, unless yields are very low, or unless excessive amounts of purchased foods are being fed, there is as yet no price incentive which would justify a partial switch from milk to sheep. Even if milk is being produced inefficiently,

provided the farmer is interested in cows, there is greater opportunity for increasing profits by improving the efficiency of milk production than there is by replacing some cows by sheep. Very different considerations arise, of course, if there is a possibility of replacing all the dairy herd by sheep and pigs and/or cash crops, but a change of this magnitude in farm organization cannot be discussed in a short article.

The following table, based on the same data as that used in Table 1, shows the probable financial effect on farm incomes of replacing some dairy cows by a breeding flock of sheep. The guaranteed price of milk for 1957–58 is 3*s.* 2·7*d.* per gallon, but because the standard quantity is certain to be exceeded, the calculations have been based on 3*s.* per gallon. The table shows that a change from milk to sheep will result in a considerable financial loss in almost every situation envisaged.

Table 2

Effect of replacing self-contained dairy cows by a ewe flock: 5 cows and followers replaced by 30 ewes—stocking density unchanged

133 per cent lambing

	£		£
Extra Costs	208	Extra Output	448
Income Lost		Costs Saved	
£105 per cow (700 gal @ 3*s.*)	525	3¾ ton concentrates (15 cwt per cow; 2·4 lb per gal)	139
		Sundry costs @ £4 per cow*	20
		Net Loss	126
	733		733

* It is assumed that depreciation on cows would be no higher than the value of calves sold.

If milk prices fall to 2*s.* 9*d.* per gallon, net loss will be £82.
If lambing is 110 per cent, loss increases by £56 to £182.
If lambing is 150 per cent, loss decreases by £32 to £94.
If only 10 cwt concentrates are used per cow (1·6 lb per gal), loss increases by £47 to £173.
If 1 ton concentrates are used per cow (3·2 lb per gal), loss decreases by £47 to £79.

Thus if lambing was 150 per cent and 1 ton of concentrates per cow was being used, the effect of replacing 5 cows by 30 ewes would be a loss of £48, or if milk realized only 2*s.* 9*d.* per gallon, a loss of £2. At higher milk yields, provided feed use is not excessive, the losses resulting from a change-over to sheep would be far greater. This is also true of dairy herds maintained by purchased replacements. If some home-grown instead of purchased concentrates were being fed in the dairy-cow rations used above, then the loss arising from the replacement of cows by sheep would be higher.

Lamb or beef?

The margins obtained from store and fat cattle are lower than those achieved in any other form of production, and it is to be expected, therefore,

that their replacement by sheep will be financially advantageous. This, indeed, proves to be so in most instances; details are given in Table 3, which is based on the same sheep input-output data used in Table 1.

Table 3

Replacement of 1 attested breeding cow rearing by multiple suckling 3 calves to be sold at 30 months as store beasts, by 26 ewes—stocking density unchanged

Assumptions: calves bought @ £15 head; cow used 15 cwt concentrates; stores sold at 9 cwt @ 150*s*.

Land Use—10 acres approximately

Lambing *per cent*		£
150	Net Gain	47
133	Net Gain	23
110	Net Loss	−33

Replacement of 10 fattening cattle, bought as 2-year-old stores, by 30 ewes—stocking density unchanged

Assumptions: fat cattle sold at 11 cwt @ 150*s*.; stores bought at 8½ cwt @ 160*s*.

Land Use—10 to 12 acres

Lambing *per cent*		£
150	Net Gain	132
133	Net Gain	100
110	Net Gain	54

Replacement of 1 attested breeding cow rearing by multiple suckling 3 calves to be sold fat or store at 18–24 months by 20 ewes—stocking density unchanged

Assumptions: calves bought @ £15 head; cattle sold @ £70

Land Use—7 to 8 acres

Lambing *per cent*		£
150	Net Loss	− 2
133	Net Loss	−26
110	Net Loss	−66

Note: Cattle prices used may not be applicable outside the South-West.

The practice of selling store cattle at the end of their second summer, or attempting to fatten cattle in under two years is spreading only slowly in the South-West, and most breeders are still keeping cattle into their third year before sale. On farms where cattle are being sold at less than two years, the change to sheep would be advantageous only when a lambing percentage in excess of 150 could be achieved.

If sheep are to replace cattle to any appreciable extent, some changes in cropping, involving perhaps a greater proportion of grass and less tillage, may be necessary. These alterations will not be substantial, however, and might only entail changing the proportion of the different tillage crops and perhaps placing more emphasis on rape and fodder roots. Such variation is

unlikely to upset the farm organization or structure of farm costs to any appreciable degree, neither is it likely to affect the labour position to an extent that would make the change difficult. Work with sheep is probably rather less arduous than with cattle and, with the exception of the lambing and shearing periods, is spread more evenly over the whole year.

The merits of the proposition that some cattle should be replaced by sheep depends, of course, upon the continuance of the present price relationship of beef, lamb and wool. Since the end of meat control, both fat and store stock prices have fluctuated considerably, but the relationship between sheep and cattle prices has not altered appreciably. For returns from store cattle to equal those from a ewe flock, cattle prices would need to rise by nearly 20 per cent, or sheep prices to fall by at least 15 per cent. Changes of this magnitude are most unlikely to occur and therefore there would appear to be every justification for the policy of increasing sheep numbers at the expense of cattle.

It is sometimes asserted that one of the main reasons for not extending the sheep enterprise on some farms is that increasing density of stocking with sheep will lead to a higher incidence of disease and therefore to a lower profit margin per acre. Were such a situation found in practice it is true that there might be a stage where further concentration on sheep would lead to a lowering of total farm profit. But, within the range found on farms in the South-West, there is no indication that profits per acre from sheep decline with higher densities of stocking. This is not to say that disease control is not important; it merely suggests that within these ranges it is not the limiting factor, or that there were farmers who had a high density of stocking with sheep, who were able to control the disease factor adequately without reducing profits.

Sheep or corn?

The introduction of sheep is also being considered on some mixed arable farms where hitherto the whole of the farm income has been derived from milk and a certain amount of cash corn and roots. We have already shown that it would not pay to cut down the size of the dairy herd, but what of the arable crops? In view of lower prices for wheat and the problem of marketing it, and assuming buildings and labour supply prohibit increasing cow numbers, would sheep be a better proposition? Or would it be preferable to grow feed corn, instead of the wheat, for the dairy herd? Obviously, circumstances will vary from farm to farm and, as already suggested, a small flock can probably be carried on many of these sort of farms without restricting other enterprises. The final decision will depend upon such factors as cereal yields, opportunity for, and skill in, using home-grown cereals, and the state of the fences. As Table 4 shows, unless cereal yields are very low and the standard of sheep management above average, the result of replacing cash cereals by sheep will be lower profits. If, indeed, cash cereals must be replaced it would be far wiser, provided yields are roughly comparable, to replace them by feed grains. This would also be most advantageous from a national point of view, since there would be no increase in the gross output of the farm.

Table 4

12 acres of wheat replaced by 30 ewes

Assumption: purchased seed used and combining by contract.

Wheat Yield		Change in profit with varying lambing percentages		
		110 per cent	*133 per cent*	*150 per cent*
		£	£	£
30 cwt/acre	sold at 28*s.* cwt	−224	−158	−136
25 cwt/acre		−140	− 82	− 52
1 ton/acre		− 56	0	+ 32

Apart from the general financial implications, many management factors have to be considered if good results are to be obtained from sheep. Fences must be sound, even for the more docile breeds. Market requirements must be studied and the right rams used for crossing to produce rapidly-growing lambs with lean carcasses. The possible advantages of lamb production from the half-bred or Clun Forest type of ewe, with its higher lambing percentage, must be carefully weighed against the present high value of the Longwool fleece. Replacement costs of the half-bred ewe are likely to be higher than for the local breeds. Lambing percentages of the Longwool breeds are often low because the ewes are allowed to get too fat, and this is perhaps of even more importance with Cluns or half-breds. Absence of flushing is one of the main weaknesses of management in existing Longwool flocks and ewes should be grazed at much heavier stocking rates before tupping, so that flushing can be of some real benefit.

This article emphasizes the importance of investigating, on paper, the probable result of any suggested changes in farm organization. Much of the publicity given to sheep production recently has suggested that sheep and higher profits are almost synonymous. That this is not so, and indeed may be the exact opposite of the true position, is obvious from Tables 2 and 4. On the majority of smaller, mainly dairy, farms it is the value of sheep as a supplementary enterprise that is important rather than their profit-producing value as a major part of the farm system. On these farms a high output per acre is an essential corollary of a high income, and sheep will not provide this. However, there are few dairy farms which could not carry a few ewes to some profit, particularly on those fields furthest away from the homestead which are often awkward to exploit fully with dairy cows.

★ NEXT MONTH ★

Some articles of outstanding interest

HEDGES IN THE RIGHT PLACE *by Charles Floyd*

NEMATODIRUS INFESTATION IN SHEEP *by C. R. W. Spedding*

SPRAYING AND DUSTING AGAINST POTATO BLIGHT *by G. W. Brenchley*

THOUGHTS ON GROWING PEARS *by B. D. Neame*

Impressions of Farm Mechanization in Russia

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Mr. Culpin, who has first-hand knowledge of farm mechanization in several countries, has through the aegis of the Economic Commission for Europe now had the opportunity of seeing a little of the methods and machinery used in the Soviet Union on the Collective and State Farms.

MY fortnight's visit to Russia, last June, even though it included a journey from Moscow to the eastern end of the Black Sea, and is supplemented by information exchanged with the Russian delegates on a number of subjects, is inadequate to qualify me as an expert on Russian farming. My views must, therefore, be accepted merely as personal impressions and the article merely an attempt to make objective comparisons between the Russian way and ours, with the limited amount of information at my disposal.

Collective Farms and Machine and Tractor Stations

There is now practically no such thing in Russia as a farm belonging to a single individual. Broadly speaking, all land of any consequence is either part of a State Farm or part of a Collective Farm. Not only are there no owner-occupiers: there are no tenant farmers either, in our sense of the word. It is thus well that from the outset the reader should understand just what the term "collective farm" implies. One visited in the region of Kharkov, which may be regarded as reasonably representative of the system, consisted of about 6,400 acres cultivated by 500 collective "farmers". Though, in theory, all workers have a voice in how the farm should be run, general management is in the hands of the chairman, and he has working under him managers of the various main departments which in this case included milk production, vegetable growing, pig production and poultry. The farm is run as a unit, and no worker is concerned more than temporarily with any particular part of the land. All the important work on cultivations is done by the local Machine and Tractor Station (M.T.S.) which, with its 75 tractors and a wide range of equipment, looks after the needs of ten collective farms within a radius of about 15 miles of its headquarters.

The Machine and Tractor Stations reminded me of overgrown War Agricultural Committee Machinery Departments, but in addition to the people concerned with the machines themselves, the station may also have on its staff various experts who are concerned with trying to see that the work done produces good results. For example, there may be crop husbandry experts, animal husbandry men who are also veterinary surgeons, and other "advisory" staff where the need is thought to justify it.

In spite of all these M.T.S. people who are concerned with running the collective farms, it is the chairman of the latter who is the "boss", once the M.T.S. contract has been argued and signed. The M.T.S. tractor drivers, for example, are responsible to him or his department managers, and they normally live on the farm and work there continuously from April to October.

The collective farms have their own stationary equipment such as electric motors and milking machines; and a concession recently granted as an experiment is permission for them to have a few of their own small wheeled tractors. They pay the M.T.S. *in kind* for the work done, and this payment, as well as the taxes payable directly to the State, usually represents a percentage of the output of the particular commodity. When all taxes and other dues are paid, and each of the collective farm workers has been rewarded according to regular scales for work done, a meeting decides what to do with any surplus. Needless to say, it is likely to be easier for a farmer who is a member of the Communist Party to rise to the higher posts or to influence policy in lesser roles.

State Farms

The State Farms differ, in that most of the machinery is owned and operated by the farms, and the workers who are paid the rate for the job have practically no concern with the financial results. As a general rule, State farms are favoured where there is no large settled population and where the work to be done by machinery represents a very high proportion of the total cost of production. Thus, State farms predominate in the regions of vast corn-growing lands (for example, near Rostov) and also in underdeveloped regions such as the tens of millions of acres of the "new lands" which are being brought into cultivation towards the east.

All the State farms that we saw tended to be rather exceptional: for example, one near Kharkov called the "Ukraine" is famous for the quality of its stock. This farm of 17,000 acres has 500 workers. The chief crops are winter wheat, maize, leys including lucerne, cereal/legume mixtures for fodder, fodder beet and sunflowers. There are 1,500 cattle (660 cows), 3,000 pigs (Large White crosses), 6,000 sheep and 3,000 poultry. Milk yields were much above the general average, at about 1,000 gallons.

Haymaking

At the "Ukraine" haymaking was going on, the equipment used being (1) a gang of three trailed 6-feet cut mowers, each with a rider, pulled by a 54-horse-power crawler; (2) a tractor-drawn dump rake 60 feet wide which ran along the partly-dried swaths and put them into windrows; and (3) a tractor sweep for collecting the crop from the windrows. Alternative equipment was a new self-propelled, pick-up baler that was being tried out and a pick-up cocker which works on swaths or windrow according to need.

At another large State farm not far from Rostov I saw more up-to-date hay-cutting machinery, with cutter-windrowers grouped around the crawler tractor, so that about 33 feet of crop is cut and put into two windrows. On

the thin lucerne crop where the machine was working, the windrows were not very thick, and after a few hours' drying they were ready for picking up by a pick-up cocker. There followed a front-attached stacker with a very high vertical lift, which deposited the large cock on an enormous trailer mounted on two multi-wheel axles. The trailer, which was pulled by another large crawler, was then towed to a suitable point where the complete load of about 12 tons was shipped bodily by hoisting up the front through a built-in winch. These methods are clearly quite unsuited to countries like ours, and I could not help wondering whether smaller and more flexible equipment would not have been much better there.

Heavy equipment

This, indeed, seemed to me to be in some ways typical of the Russian scene. Many of the haymaking problems there really stem from the fact that hitherto the main unit of power has been a 54-horse-power crawler tractor—a good machine for ploughing and heavy cultivations, but hardly suited to hay harvesting. In their efforts to provide an adequate load for such tractors, the Russians have developed very large machines of many kinds. For example, one of the most popular trailed combine harvesters, with its straw-collecting tank, weighs 7½ tons. The Russians fully appreciate the problem, and are planning to alter drastically the ratio of wheeled to track tractors by 1960. Of their present 850,000 tractors, about 25 per cent are wheeled; by 1960, when they intend to have 1,200,000 tractors, about 65 per cent are to be of various wheeled types—mostly equipped with pneumatic tyres, hydraulic lift and three-point linkage.

In the meantime, they tend to be several years behind us in most aspects of mechanization, though they are breaking new ground with developments in a few directions, such as with machines for harvesting maize cobs and cutting and collecting the stalks for silage. The maize-stalk silage inclines to be a very low-quality roughage, of course, but is better than nothing where stock-feed is scarce.

Three-phase milking machines

Another Russian mechanization development which I believe is unique, is what they call the three-phase milking machine. Russian physiologists, working closely with the machinery people, have come to the conclusion that all the machines currently used in the rest of the world are fundamentally wrong in principle because of the tendency of the teat-cups to creep up the teat and constrict the blood vessels of the udder. They maintain that the consequences of this action are so disastrous in respect of udder diseases that one dairymaid can be trusted to handle only a single unit. The result is a maximum milking of ten to twelve cows per hour. At present there is a tendency in Russia to ignore the point that this does not correspond with the real facts in countries such as England, where one man often handles three units.

In any event, the Russians have developed and are now using on a rapidly increasing scale a machine which incorporates, in addition to the two phases

with which we are familiar, a third phase of complete rest, where pressure both inside and outside the liner is atmospheric. This certainly achieves its object, for with it the teat-cups tend to fall off the udder, and have to be supported in place by a surcingle. Regardless of whether their hypothesis on two-phase milking is correct, the Russians are satisfied with their three-phase and are using a good deal of propaganda to get the dairymaids up to the target of milking twenty cows per hour with two units. The research going into the problem will inevitably lead to progress, but in the meantime rather a lot of dairymaids are still employed for milking, even with the new machines.

A noteworthy development which follows the trend in many parts of the Canadian prairies is the use of the windrow method of harvesting corn crops. The Russians are so convinced that this is the right method, that they are now measuring their progress in harvesting mechanization by the percentage of crops harvested by the two-stage method. They estimate that in their conditions the windrow method saves from 2 to 25 per cent more grain than direct combining.

Catering for progress

Directions in which impressive progress is being made include some which are fundamental to securing greater success in the future. Even allowing for the fact that research institutes, testing stations and teaching and training centres must contribute more than where a private manufacturing industry carries out a great deal of such work, it seemed to me that the establishments concerned with such matters were gradually being equipped to cater for progress and not merely for maintaining the present situation. Along with good work that is being done on such day-to-day problems as repairing machinery more economically, there goes more fundamental research aimed at the introduction of new techniques and new machines.

Moreover, the Russians do appreciate, very much more than is general in Britain, the vital importance of good teaching of farm mechanization. Alongside the famous Timirazev Academy near Moscow, where 2,000 students attend for their five-year degree courses in various aspects of agricultural science (for example, crop and animal husbandry, and plant pathology), there stands the Institute of Mechanization which also has 2,000 students, most of whom take a five-year training course in farm mechanization.

It can be argued, of course, that if more students were trained in other aspects of agriculture and less in mechanization there would be fewer crop failures. My personal view is, however, that apart from a few points like using more fertilizer, more progress is still likely from mechanization developments than from other more scientific advances.

British Seeds at the Toronto Fair

In the summer of 1952 Mr. W. F. Darke, then serving as Agricultural Adviser to the U.K. High Commissioner in Ottawa, came home to England on leave. This fact is not noteworthy in itself, but it was to have unforeseen results, for he seized this opportunity of capturing the interest of the British Seeds Trade in the possibility of entering the seeds competition at the annual Toronto Fair. What better way, he asked, was there of making known in Canada, and incidentally the United States, the high-class quality of British seeds and so promoting the demand for them on the other side of the Atlantic? His undisguised enthusiasm was infectious, and that autumn a first collection of 167 home samples was entered.

With the exception of the war years, the Royal Agricultural Winter Fair has been held in Toronto every year since 1922. It is to Canada what the annual Show of the Royal Agricultural Society of England is to us—a venue of international importance where commerce flourishes in a markedly social atmosphere, where the best products of the Canadian agricultural and ancillary industries are paraded and displayed, where farmers and merchants (and often their families) come to criticize and remain to admire.

On its 26 acres, under one roof, the Toronto Fair is a show of many parts, any one of which can claim to be a show in its own right. But it is more than a place to exhibit the products of the farm. It is also a market where pedigree stock are auctioned to new owners, and the carcass classes come to the hook in the Fair's large refrigerator before they, too, are sold to the highest bidder. The seating around the judging ring will accommodate over 7,000 people, and some 130 judges are normally required to deal with the various classes available to exhibitors. Each section has its own director, and there are twenty-two standing committees to organize the parts to make a comprehensive whole.

Since the first British entries in the Seed, Grain and Hay section were sent in 1952, it is a notable fact that we have won a world championship every year, except 1953. In 1952 it was for rye, 1954 and 1955 oats, and 1956 forage seeds.

At this year's Fair, which was held from November 15th to 23rd, British seed growers and merchants were again prominent among the prize-winners. The Canadian National Railway's Challenge Trophy, conferring the world championship for wheat was awarded to Mr. A. Davidson of Dengewell Hall, Manningtree, Essex, for a sample of Cappelle Desprez, entered in association with Messrs. Brooks (Mistley) Ltd. This is particularly praiseworthy in view of the keen competition which had to be faced from Canada and the U.S.A. The Canadian Seed Trade Association Challenge Trophy, conferring world championship for forage seeds, again came to Britain for a sample of S.37 national certified cocksfoot, entered by Bowen Roberts Farms Ltd. of Finchinfield, Essex, in association with the Eastern Counties Farmers Ltd.

World Food and Population

GEORGE ORDISH

Mr. Ordish's commentary on the latest F.A.O. Report shows food to be the common denominator of mankind. As such, hungry people and underdeveloped national resources today constitute a *world* problem—not merely one of a local area.

The Principle of Population was published in 1798, and since that day the Malthusian Theory—the belief that population must inevitably outgrow the capacity of the land in supplying food for that population—has alternated between being trusted implicitly and discredited entirely. Between these extremes a position of some confusion has arisen today because on the one hand we are told the world is hungry and on the other we find many farmers in a depressed state because of lower prices, or that some countries such as the U.S.A. have large unsaleable surpluses. In consequence, it is of interest to examine this problem, particularly in view of the new edition of *The State of Food and Agriculture*, just published by the Food and Agriculture Organization of the United Nations.[1]

The matter can conveniently be considered from a number of points of view—the world aspect and that of the United Kingdom, both now and in the future. We need to know the world population and the food it produces, Britain's population and food production, whether the world is adequately fed at present and whether it can either become or remain so. Most of the statistics on which this article is based have unfortunately to exclude the U.S.S.R., as so very little is known about that country.

The population of the world (1955) was 2,691 million (2,491 million, excluding the U.S.S.R.),[2] and its agricultural production is summarized in Table 1.[2, 3] The columns for the world and Europe exclude the U.S.S.R., that for N. America excludes Mexico, which country, together with the West Indies, is entered under Latin America.

The production per head does not bear much relationship to consumption, but it does indicate what supplies are available and which are the exporting areas; for instance, the world's cereal production amounts to 294 kilos per head per year and varies from the high figure of 966 kilos per head for North America to 161 kilos per head for Africa. In the United Kingdom it is 174 kilos per head. Meat production varies from 74 kilos per head in North America to 7 kilos per head in Asia.

Production to match hunger

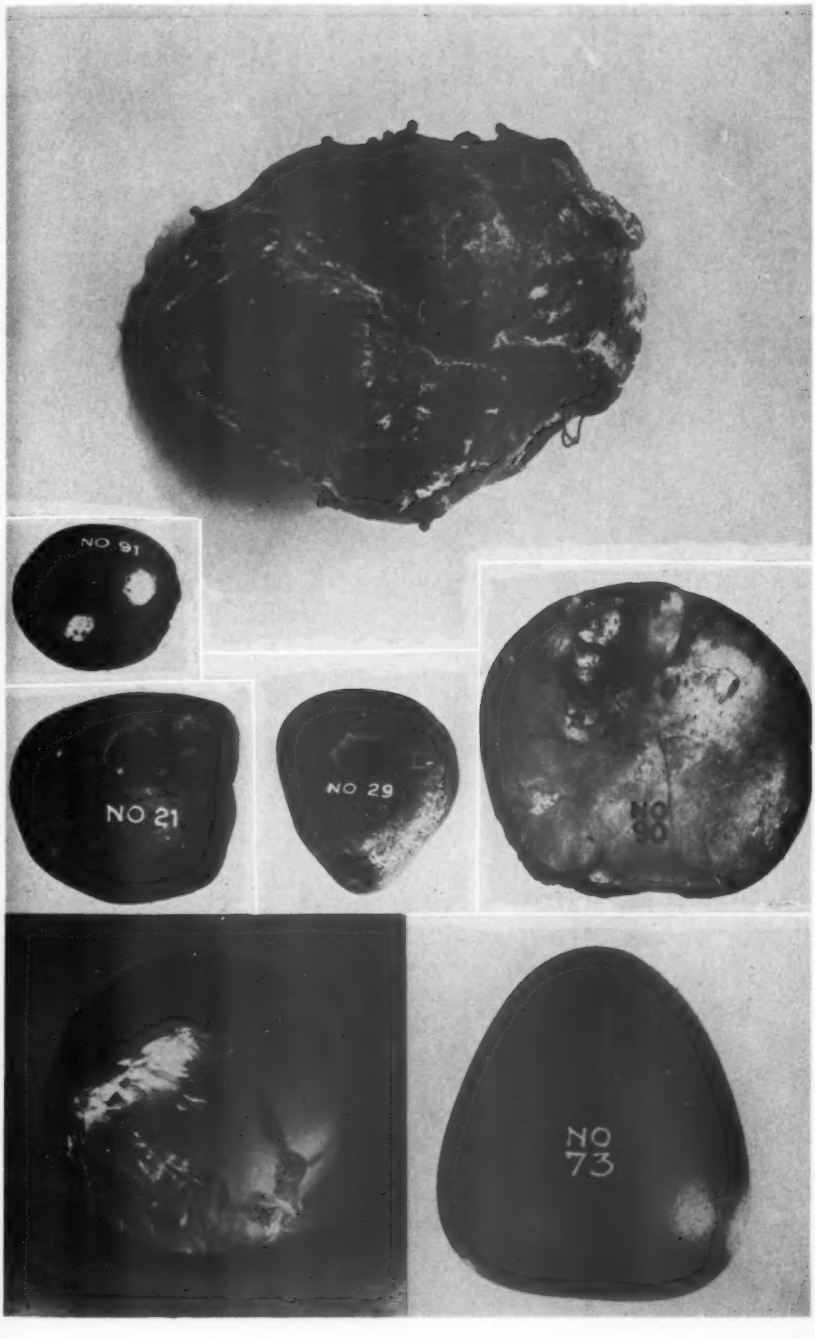
The figures from official sources for the world's consumption of food are not as adequate as those for production, but a summary of some of them is given in Table 2.[2] Food may conveniently be considered in terms of

Photo: *United Nations (Dept. of Public Informati*

This child does not understand the significance of the words "calorie" and "protein", but he is all too familiar with the anxieties of waiting for a small ration of milk to eke out his meagre diet.

FIG. 1: Harvest amulet known as a *Clyack* (Aberdeen); approx. 10½ in. wide and 15½ in. high.

FIG. 2 (opposite): Calf's heart pierced with pins (Dalkeith). *Charm stone amulets:* No. 91, mottled serpentine (Shetlands); No. 21, naturally perforated greenstone pebble (Cumbernauld); No. 29, green sandstone pebble with two perforations and the name William H. Scott scratched on one face (Dumfries); No. 90, disc of yellow flint (Slains); *Clach-na-Brataich* or stone of the standard (Perth) reproduced by permission of the Clan Donnachaidh Society; No. 73, dark-red, heart-shaped stone (Shetlands).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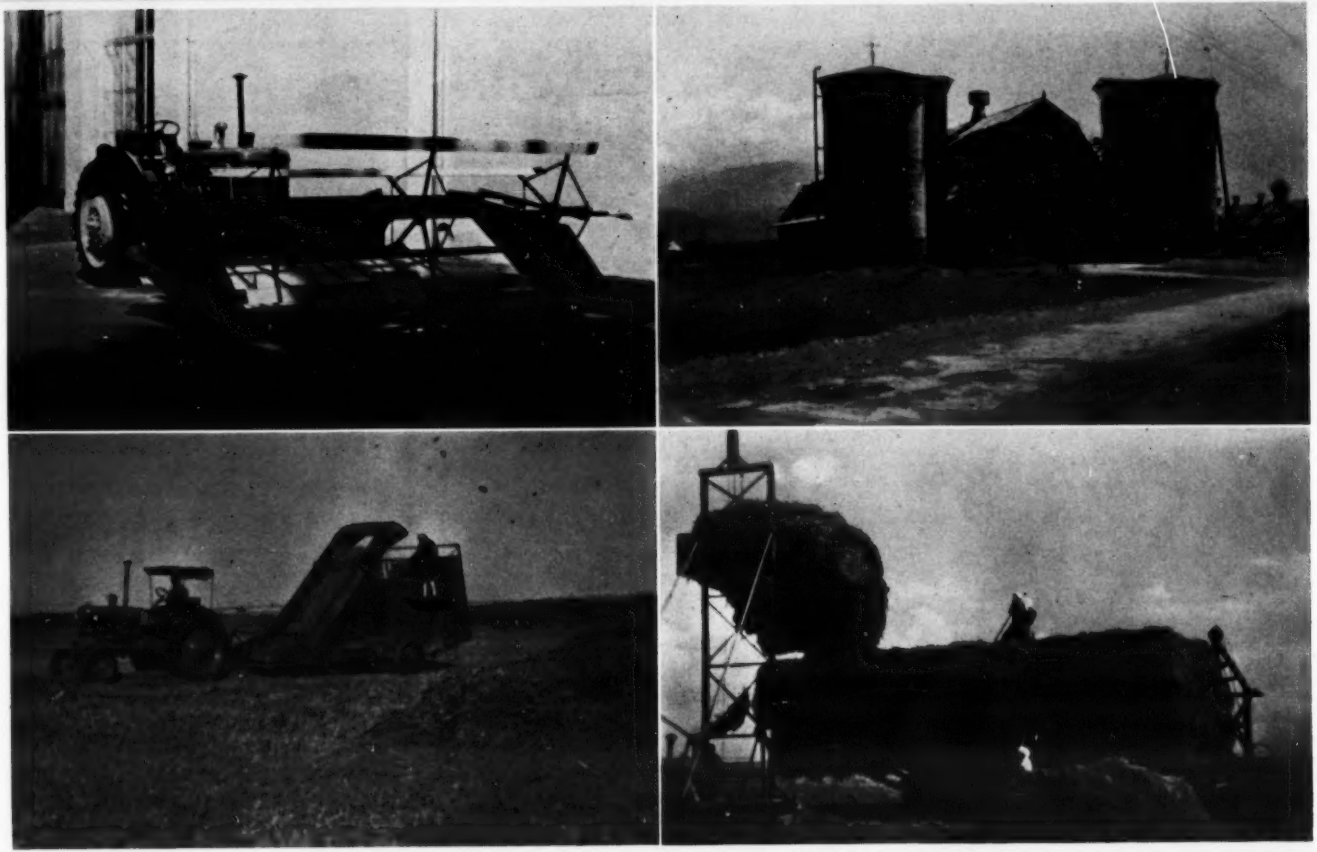


Impressions of Farm Mechanization in Russia (Article on pp. 443–6)

Table 1: World Production of Major Crops

Crop	World		Europe		North America		Latin America	
	Million metric tons	*Kg (per head)*	*Million metric tons*	*Kg (per head)*	*Million metric tons*	*Kg (per head)*	*Million metric tons*	*Kg (per head)*
Cereals ..	731·3	294	125·6	307	173·8	966	38·4	211
Sugar ..	41·3	16	10·1	25	3·2	18	12·9	71
Potatoes ..	226·2	91	122·9	300	13·1	73	8·4	46
Pulses ..	25·2	10	3·0	7	1·0	6	2·7	15
Oilseeds ..	58·6	24	2·2	5	18·1	101	4·2	23
Cotton ..	7·5	3	0·1	2	3·2	18	1·2	7
Meat ..	47·65	19	13·8	34	13·272	74	6·458	35

Crop	Asia		Africa		Oceania		United Kingdom	
	Million metric tons	*Kg (per head)*	*Million metric tons*	*Kg (per head)*	*Million metric tons*	*Kg (per head)*	*Million metric tons*	*Kg (per head)*
Cereals ..	349·7	236	36·1	161	7·7	527	8·9	174
Sugar ..	10·5	7	2·2	10	2·4	164	0·7	13
Potatoes ..	61·1	41	20·1	90	0·6	41	6·4	125
Pulses ..	16·6	11	1·8	8	—	—	0·4	8
Oilseeds ..	29·1	20	5·0	22	—	—	0·1	2
Cotton ..	2·3	2	0·7	3	—	—	—	—
Meat ..	9·99	7	2·32	10	1·88	129	1·57	31

calories and protein, and it is usually taken that an adequate diet should contain between 2,400 calories per day in the tropics to 3,000 in colder climates, and about 75 gm per day of protein.

Examination of Table 2 at once shows the deficit and surplus areas, but it should be noted that the figures are weighted averages of a few countries

Impressions of Farm Mechanization in Russia

Front-mounted swather for cereal harvesting. The tractor a is 35-h.p. diesel with hydraulic lift and 3-point linkage.

Two storey dairy barn with concrete tower silos.

Hay harvesting near Rostov. The pick-up cocker produces rectangular heaps which are lifted by the stacker shown in the next photograph.

Front-mounted, vertical-lift tractor stacker placing its load on a 15-ton trailer. The device at the front of the trailer is used for lifting the front of the platform to deposit the load.

Impressions of Farm Mechanization in Russia (Article on pp. 443–6)

Table 2: Daily food consumption per head in different areas (weighted averages) 1954–55

Area	Calories	Protein (g per day) Total	Animal
EUROPE	2,901	83·7	39·3
NORTH AMERICA	3,075	92·5	63·0
LATIN AMERICA	2,422	66·2	25·4
ASIA (only India, Pakistan, Japan, Israel, Turkey)	1,967	53·0	7·8
AFRICA (only Egypt, Central African Federation, Union of South Africa)	2,542	73·3	17·8
AUSTRALIA and NEW ZEALAND	3,229	90·6	58·4
UNITED KINGDOM	3,270	85	48

only and that the countries omitted from the table tend, for lack of statistics, to just be those with a low standard of living. Furthermore, it must not be assumed that calories and protein are all that is needed to feed a man adequately, because vitamins, minerals and a palatable and varied diet are equally necessary, but if the calories and protein are sufficiently high the rest usually follows.

We are thus able to answer the first part of our inquiry—the adequacy of present food levels: it is that whilst most of the world is sufficiently well fed, there are considerable areas in Asia, and probably Africa, where supplies are inadequate, and it is most likely that there are some areas of undernourishment in Latin America as well. The United Kingdom has a high standard of diet, but produces only about half her own food; for instance, she produces 174 kilos per head of cereals and consumes 336 kilos per head. World agricultural production (excluding the U.S.S.R.) in 1956–57 increased by about 3 per cent, which was the same rate of increase as in the previous year,[1] and world population (excluding the U.S.S.R.) increased by 1·2 per cent,[2] so that the increase of food raised was greater than the increase of new mouths to be fed, particularly when it is remembered that the new mouths eat very little. The increase over a longer period—the last eighteen years—has been at the rate of about 1·4 per cent per year, so we are justified in saying that world agriculture is at present more than keeping pace with world population and could even be making inroads into present deficiency areas and improving their position.

A 3 per cent increase per year is indeed a large one. It is in fact much larger than it might seem, because a number which increases steadily at the rate of 3 per cent per year doubles itself in about twenty-three years, and as the increase of agriculture is about 1½ per cent faster than the rate of world population increase (which at 1·4 per cent per year would only double itself in fifty years), one might well suppose that there was no cause for alarm. But it does not take much perspicacity to see that were the population continually to rise at the rate of 1·4 per cent per year, a point must come where there would not be enough agricultural land to support them. In fact, carried far enough, a point must arise where there would not even be standing room on the earth for them.

How near are we to these points? To take the last first, and to give some

reality to those figures—a very long way: it used to be said that the population of the world could stand on the Isle of Wight; they can no longer do that, but they could easily stand in the county of Kent, at the rate of 1·8 persons per square yard! The more important question is at what point would agriculture fail to feed the population? The F.A.O. is silent on this ultimate question, though it gives much guidance on trends. At the recent meeting of the British Association for the Advancement of Science, Mr. A. W. Marsden foresaw that agriculture could feed double the present world population, but it would have to draw considerably on the chemical industry in order to do so.[5]

The writer is indebted to a colleague, Dr. C. C. Tanner, for the observation that it is protein supplies that will be the difficulty should considerably greater numbers have to be fed, or even if those at present in the underdeveloped areas are to be fed adequately. There will be a tendency for the cost of protein foods to increase as the natural residual nitrogen in more or less virgin soil is exhausted: this will most probably be offset as economies are made by the increase of yields per acre due to better varieties, the use of fertilizer and the prevention of losses from pests.

The world's farmers do not produce food out of their love for humanity but because it is their business, and the F.A.O. report shows that during 1956–57 the terms of trade moved farther against farmers, although at a slower rate than in previous years. That is to say, the prices received by farmers increased less than the prices paid by farmers, but the deterioration of the position was not so great as before.

Expenditure on food

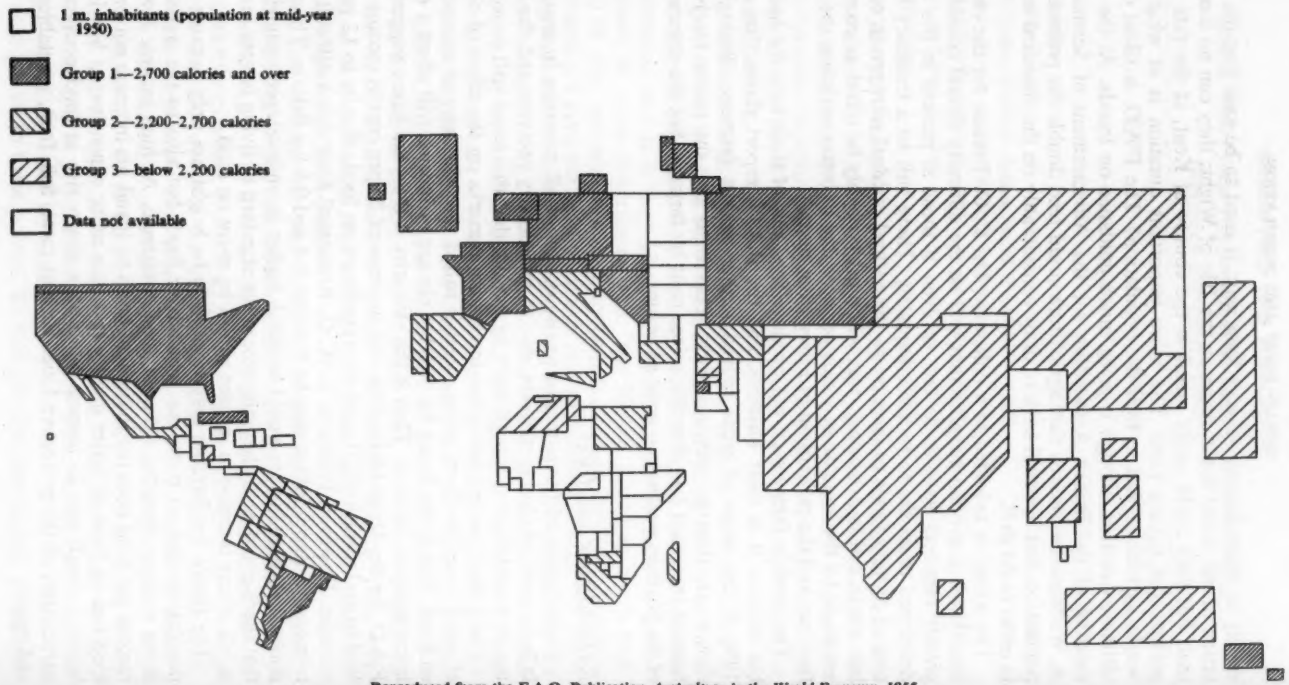
Retail prices of foods tended to rise in almost all countries in contrast to falls in most wholesale markets, due to inflationary pressure and the lowering of subsidies, and it is thought by F.A.O. that this trend will continue.

The F.A.O. survey has some interesting remarks on the effect of changes of retail prices on farm prices, what is called the "elasticity of expenditure" on food. This is the factor by which a change in income will affect a change in expenditure on food. Thus if the elasticity is 0·6—the figure suggested by F.A.O. for the United Kingdom—an increase of 20 per cent in income would lead to an increase of $20 \times 0{\cdot}6$ in expenditure on food; that is, to 12 per cent increase. However, Professor E. A. G. Robinson[6] finds this a difficult figure to measure, and thinks it may be between 0·4 and 0·6 for Britain. There is no doubt that these factors would be much higher in undeveloped countries and that there could easily be unity where the standard of living is very low; that is, all of any increase in income would be spent on food.

The future for farming may be seen to be bright not only because as the population rises so must the demand for food, but also as the standard of living rises so does the value of food consumed. At high income levels, as income per head rises the individual tends to spend his increase not on more food but on food of better quality and thus more expensive; at low income levels, a small rise in income leads to a sharp rise in food consumption, particularly of the protective foods such as meat, fish, fruit, vegetables, milk and eggs.

Distribution of the World's Population according to Daily Calorie Intake

(Country areas proportional to population)


1 m. inhabitants (population at mid-year 1950)
Group 1—2,700 calories and over
Group 2—2,200–2,700 calories
Group 3—below 2,200 calories
Data not available

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More food can be produced

If from the demand point of view the future of farming may be seen to be bright, how does it look from the production side? Can farmers produce enough food to meet this increased demand? It is undoubtedly true that they could produce much more: as noted above, A. W. Marsden foresees that we could feed double the world's present population, but it would not be done without difficulty. It would call for a considerably increased use of fertilizer, and we might well find that certain "trace elements", which are now only occasionally needed, would become an everyday article on the farm.

In the United Kingdom we use about 296,000 tons of fertilizer nitrogen yearly,[2] and the per acre consumption figure is low compared with other grassland countries such as the Netherlands and Denmark. It is sometimes suggested that we waste a great deal of our nitrogen because we have a water-borne sewage system, which carries a great deal of valuable plant food down our rivers and out to sea. Investigations suggest that this is not more than some 37,000 tons of nitrogen a year and that in a crowded island, where consideration must be given to public health, there seems to be no alternative. This loss is consequently inevitable. Moreover, it is not lost to the *world*, as the river-borne nitrogen must increase the growth of plankton in the sea and consequently the weight of fish available. Even in the United Kingdom the loss of 37,000 tons of nitrogen in sewage is compensated by the landing of 27,000 tons of nitrogen in 1 million tons of fish.[6]

Fish farming may become more important

The world consumption of fish is some 28 million tons,[6] which is not a negligible amount, and fish farming may well become more important. The world's fish landings represent some three-quarters of a million tons of nitrogen, some of which (perhaps half) returns to the soil, particularly in the less advanced countries. The world usage (excluding the U.S.S.R.) of fertilizer nitrogen is 6·3 million tons. If half be considered as directed to making vegetable protein at an efficiency of 50 per cent and half to animal protein at an efficiency of 8 per cent, the amount available per head is only 10 g per day of vegetable protein and 1¼ g per day of animal protein. It is only by means of legumes, fertilizer and fishing that supplies of protein can be increased, and there is no doubt that these three factors will all play their part in securing food for a larger and better-fed world population.

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Recent Experiences in the Control of Apple Scab

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The effectiveness of spraying against apple scab depends very largely on its timing. Better practice in the important apple-growing area of Wisbech in the past six years is giving a tighter control of the disease there.

APPLE scab is probably the most costly plant disease we have to deal with in this country. The majority of commercial orchards are given at least five fungicidal sprays in a season to combat the disease; and in view of the time and money spent on these treatments, there is every reason for trying to ensure that the maximum benefit is derived and that scab is well controlled. This fungus disease can attack the leaves and fruit and in some varieties the wood as well, so reducing the tree's vigour and yield. Furthermore, scab markings lower the market value of the apples considerably. Badly affected fruit crack readily, and it is often in this way that other fruit rotting fungi, for example, brown rot and canker, gain entry. Scabbed fruit in store loses water more quickly than clean fruit and shrivels if kept for any great length of time.

Nearly six years ago I was given the task of investigating the failure to obtain an adequate control of the disease in the fruit-growing area around Wisbech and King's Lynn. Here the susceptible variety, Bramley's Seedling, is widely grown, and the low-lying, fertile soils facilitate development of the disease. In some seasons ten or more fungicidal sprays would be applied to the orchards without effecting any real measure of control, and the problem was to find an explanation for this and to suggest means of improvement.

In dealing with any disease problem, whether in animals or plants, it is of the utmost value to know from where the first infections come. After the first year's observations (1952), it was apparent that the trees were becoming infected at an early stage of their development in the spring, and we wondered whether the scab fungus was overwintering in the bud scales, as Dr. R. McKay had found in Eire. At this point in the investigation, we were able to obtain the help of Dr. J. M. Hirst of the Department of Plant Pathology at the Rothamsted Experimental Station. He had been studying the epidemiology of potato blight and had developed a trap capable of sampling the spore content of the atmosphere. It was hoped that by this means we should be able to determine the type of spore which caused the first infections in the spring—whether it was the ascospores from the overwintered leaves in the orchard, or the conidia from the wood and bud scales, or whether, perhaps, both together were responsible. The first year we used the trap happened to be a particularly bad one for scab, but our findings then have been largely confirmed by those of the following years.

During the early years of the investigation there was an almost complete change-over in the type of fungicide used. In 1952, lime sulphur or Bordeaux mixture were used as scab fungicides in the majority of orchards, but by 1955, very little of either was being applied. Mercurial fungicides had been widely adopted. We were able to follow this change-over closely and to gather information as to how the best results could be obtained. There is a general dislike of the sulphur fungicides in the Wisbech area because, in some seasons, they are inclined to damage the trees. In this respect the Wisbech district and the apple-growing area in Northern Ireland have much in common.

Origin of infections in the spring

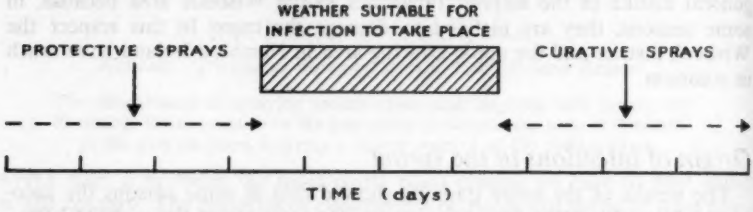
The results of the spore trapping showed that in some seasons the ascospores from the fallen leaves were present in the air of the orchard before bud-burst. Large numbers of such spores could be trapped about the time of bud-burst and they could usually be found, after rain, until mid-June, although by that time they were very few. Provided the weather conditions were right, infection could take place as soon as the leaves were exposed, and when this happened the first scab spots could be found on the leaves by the end of April. We found that spray programmes which depended on bud stages for the timing of the fungicidal sprays were unsatisfactory.

Long, dry spells in the spring have occurred in most years and exerted a marked influence on the number of spores present in the air of the orchard. Such periods early in the season have been followed by the release of large numbers of spores when rain came. In addition, there was often a complete change of weather system following a dry spell and suitable conditions were provided for infection to take place. A proper understanding of the relationship of this kind of weather to the problem is essential if an effective control of scab is to be obtained. The result of the battle against scab can often depend on whether an orchard is unprotected by a fungicide during the few days following the end of one of these dry spells.

Mercurial or sulphur sprays?

From a survey of orchard spray practice begun in 1953, it was soon obvious that the control given by the mercurial fungicides was superior to that of the sulphur fungicides. The rapidity with which the change-over from sulphur to mercury took place was remarkable, and it was clear that the two main groups of fungicides were behaving in quite different ways. While the sulphur sprays were acting as protective fungicides and needed to be in position on the leaves before infection took place, the function of the mercurial fungicides was mainly curative, in that infections which had either just started to develop or had in fact been established for some time, were being killed. The value of this curative type of action had been demonstrated in America and several European countries; our results fully agreed with those from abroad and indicated that the mercurial fungicides were giving their best results in this way.

The following diagram illustrates the essential difference between these two groups of fungicides. Clearly the best time for application differs for each group, and it is almost impossible to assess the relative merits of the two groups unless each fungicide is given the opportunity to exert its maximum effect. Protective fungicides are the most difficult to apply to advantage because of the problem of forecasting the weather.



The most effective applications of the mercurial fungicides were those given within four days of infection. In view of the limited time available in which to get round with sprays of this type, it is necessary to be able to recognize the infection periods. In America, Dr. W. D. Mills carefully tabulated the length of time the leaves required to be wet at various temperatures for infection to occur; we found his work most valuable and have no reason to think that the data is unreliable for conditions in East Anglia. In the early stages, we relied on leaf wetness, but a simplified form of dew balance has been designed recently by Dr. J. M. Hirst[1] so that it is now possible to measure the leaf wetness without constant observation of the trees. The device is very simple and we shall be interested to see to what extent it becomes a standard piece of equipment for the modern orchard.

At the Crop Protection Congress in Hamburg in September at least four different types of recorder were described for measuring periods of leaf wetness. A very high level of scab control is being obtained where greater attention is being paid to the correct timing of sprays. This was apparent in the fruit-growing area of the lower Elbe, where almost perfect conditions for scab exist. Water-filled dykes intersect this low-lying region—often they are not more than 20 yards apart—and the trees are overcrowded.

Another interesting development in many Continental countries has been the introduction of warning systems—by radio, telephone or even word of mouth—indicating that conditions suitable for infection had occurred. In most instances the areas covered were relatively small, with a fairly concentrated fruit acreage. Whether such systems can be worked in this country remains to be seen, but the results of giving spray warnings in the Wisbech area have been most encouraging. Even without elaborate equipment, much can be done by the grower himself using a maximum and minimum thermometer, a good eye and common sense.

Spray persistence and methods of application

The transient nature of the fungicidal deposits on trees sprayed during the time of rapid leaf development was soon realized. The area of new leaf expanding daily during the early part of the season is very considerable and

very little fungicidal effect could be observed ten days after the application of one of the sulphur fungicides. Many cases of failure to control scab can be attributed to a spell of weather suitable for infection occurring just when the fungicidal cover should have been renewed. It is useful to have some idea of how long the various types of fungicidal deposits remain effective. Dutch workers have tried to give to each fungicide a figure that represents (a) the number of days during which, under normal conditions, effective protection is given following application and (b) the number of days following infection during which a curative effect is possible.

Throughout our investigations we have tried to see how far the methods of application were at fault. In only one or two cases, for example when the tractor was driven at too high a speed for an automatic sprayer, have we been able to blame the method of application. The high degree of control obtained within recent years has been achieved with much the same spray machinery as when lime sulphur was the main fungicide in use.

There has been a marked interest in low volume fungicidal applications of the order of 30–50 gallons per acre. In 1955, an attempt was made to compare the effectiveness of this type of spray with the more usual high volume application. Three orchards receiving low volume application were compared with three orchards with a similar spray programme but receiving high volume applications. In that year, April 27 was an important infection date and failure to obtain good control at that time affected scab control for the remainder of the season. The comparison between the two methods is shown in the following table, and the scab on the fruit was assessed by using the method described by Croxall *et al.*[2]

Comparison of high and low volume applications of a mercurial fungicide for scab control.

Bramley's Seedling, Wisbech 1955

Orchard	Phenylmercuric nitrate fungicide*		Spray after April 27	No. of sprays April 27–May 28	Mean scab assessment
	lb/acre	*gal/acre*			*per cent*
A	4	35	April 29	3	0·003
B	3	175	April 29	3	0·006
C	2·25	50	May 3	3	0·030
D	5	250	May 3	3	0·020
E	2·25	50	May 3	3	0·033
F	7	350	May 3	3	0·018

* Phenylmercuric nitrate in the form of a dispersible powder containing 1·58 per cent (wt/wt) Hg.

Very effective control was obtained by low volume applications, and it is remarkable how little fungicide was being used in some orchards to achieve this result. Within limits, the more fungicide applied the better the control, but more important was the timing of the sprays, especially in relation to April 27.

The value of ground sprays to kill the fungus in the overwintering leaves has long been advocated from America. We have carried out experiments to ascertain the value of DNOC (sodium-dinitro-ortho-cresol) for this purpose and have achieved a high degree of fungus killing, provided sufficient volume of liquid was applied to the floor of the orchard. The possibility of some late

DNOC sprays acting as curative fungicides cannot be ruled out. This would happen when a late application is given following bud-burst and may account in some measure for the good reputation of this type of spray.

In Australia recently, applications of mercurial fungicides have been given to the trees after the fruit has been picked, the object being to kill the scab on the leaves and so prevent the formation of the fruiting bodies which produce the ascospores in the following spring. Both this method and DNOC ground spraying are attractive, in that we are trying to get at the fungus before it starts damaging the tree. It may well be that in future years more attention will be paid to dealing with the fungus during the times when there is no fruit on the trees or when the leaves are on the ground.

Thus several means of apple scab control are now available to the grower, but during recent years great improvement in the control of the disease has been obtained in the Wisbech area by paying more attention to correct timing of the fungicidal sprays. This has been most effective with sprays showing curative properties and which can kill out the infections in the early stages of their development. Unfortunately, every variety will not tolerate mercurial sprays, but it is hoped that new curative fungicides suitable for all varieties will be developed. At present, captan is about the only other material which can be used safely on all varieties, and to obtain good results the spray must be applied within thirty-six hours of the start of infection.

References

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Early Farming Transfer Charm Cures

THOMAS DAVIDSON

Diseases of farm stock were, until comparatively recent times, still being treated by superstitious practices inherited from the dark ages.

IN the latter half of the nineteenth century a farmer in Buchan, when given notice of eviction from his farm, drove his plough with all the soil it would carry off the farm and unyoked it on a neighbouring farm. In this way he believed that not only would the incoming tenant be deprived of the goodness of the soil, but its fertility would be transferred to his neighbour's land.

This is an example of a survival of a very ancient and widespread superstition—that disease, sickness, good and bad luck could be transferred from one object to another. But before explaining the reason for such beliefs, let us first obtain a clear idea of the various forms of the rites with which we are dealing. To clarify the treatment, the various cures and inflictions brought about by transference rites can broadly be grouped under three headings:

transfer of a disease from an animal to an inanimate object such as the ground, from one animal to another, and by the potency of charms and amulets.

In the north of Scotland it was firmly believed that animal diseases of every type could be carried and left upon another farmer's land. Among the cattle in Caithness a distemper appeared called *the heastie* which, it was alleged, "putteth them in a rage, and killeth them suddenly". By carrying a portion of the diseased animal from the owner's ground to the ground of another, the latter's cattle sickened, while those of the former recovered. In Mull the *black spauld*, the symptoms of which were a mortification in the legs and a corruption of the blood, raged like a pestilence among black cattle. One of the remedies was to bury alive the first cow to be afflicted and drive the other cattle backwards and forwards over the pit.

Some transference charms are shown on pp. ii and iii of the art inset. The calf's heart shown in Fig. 2 is interesting, in that it has the power of transference and the enhanced virtue of punishing the witch supposedly responsible for the incidence of the disease. It was found under the floor of an old house in Dalkeith in 1812. This house was at one time occupied by a family which kept cows, and according to the record, a disease thought to be due to the effects of witchcraft broke out and spread among the cattle. To arrest the disease, the heart of one of the diseased animals was taken out, roasted on a spit and with each turn of the spit a pin was stuck into the heart until it was completely roasted. The heart was then buried secretly near the cattle.

Further south in the Lowlands the *routing evill*, "a strange and suddane diseas quhairthrow an ox was never able to ly down, bot routted continuallie till he deid", was cured by taking "one quick ox with one catt, and one grit quantitie of salt and procedded to burie the ox and catt quick with salt in one deip hoill in the ground, that the rest of the guidis might be fred of the seikness or diseases".

These beliefs assumed such proportions in the north of Scotland that the Synod of Aberdeen, in 1659, recommended "all ministers within the province to speak against charming heathenish customs in cutting off the heads of beasts and carrying them from one laird's lands to another", and as late as 1881, a farmer in Keith carted the carcass of an animal to a hill on the property of the Earl of Scarfield and buried it there.

An inscribed charm from Yorkshire prescribes as a cure for diseased cattle the piercing of an ox heart with nine new pins, nine new needles and nine small nails. The heart had to be burned at midnight, while two cursing psalm verses were said. Here again, as in the Scottish example, the intention was to torture the person who had charmed or bewitched the cattle.

In Suffolk the only effective cure for an epidemic of abortion was to bury one of the premature calves in a gateway through which the herd passed daily. And in the same district, when a horse or ox had any ailment in the feet or legs, the first sod on which the animal put its feet in the morning should be dug up and turned over. This was considered an almost certain cure. It will be noted that in most of the examples quoted, the disease was thought capable of being cast out by burying a part, or the whole, of a diseased animal, so that as the animal's body slowly rotted away in the soil, the disease would similarly die out of the rest of the herd.

Ritual sacrifice

There are a great number of variations on this simple idea. Instead of burying one of the diseased animals, one of the prime and healthy beasts might be killed and buried; for example, during the Marshland, Lincolnshire cattle plague of 1866, a calf was killed and solemnly buried feet pointing upwards at the threshold of the cowshed. The charm failed to stop the plague because, we are told, the farmer sacrificed instead of his best calf, one of little value. A variant method of disposing of the animal is found in Wales where, in 1812, a particularly violent disease broke out among the horned cattle. The farmers in the districts affected united to sacrifice a bullock, which they carried to the top of a precipice and flung down. This was known as "casting a capture to the devil".

Murrain in the Kilkenny district of Ireland was at one time attributed to a sting on the mouth from the larvae of a particular species of moth. The cure was fairly simple: a hole was bored in an ash tree and then plugged with one of these live caterpillars. As an incidental feature, the leaves of that ash tree were held thenceforth to be a specific against the disease. The belief here denotes a degree of primitive reasoning which is significant when we realize that inoculation, as we know it today, was the outcome of similar reasoning.

There are many records of disease being transferred from one animal to another and from an animal to a human being. One example comes from Lewis, where in 1890 the cure of liver disease in cows was practised by placing a black cock between the legs of the sick cow, then splitting open the bird's back, taking out the heart and, while the fowl was still gasping, the heart given in water to the cow to drink. When a horse belonging to Duncan Alexander in Newburgh was bewitched, Helen Fraser transferred the sickness from the horse to a young cow. The cow died, and was thrown into the Burn of Newburgh. Unfortunately, the method used for the transfer is not recorded.

Finally in this group, a species of cattle madness, *Na Gemmraich*, or cattle-lowing, a disease which responded to no known cure, was held to be curable only by the transfer of the disease to a part or the whole of a human body. There is a tradition in Breadalbane that when a pestilence raged among the herds on the south side of Lochtay, the farmers seized a poor "gangrel body" (vagrant), bound him hand and foot and placed him in the ford of Ardtalmaig burn. All the diseased cattle in the district were then driven over his body, crushing the life out of him.

Charms and amulets

The greatest variation in type and number is to be found in the third group, where both cures and protection against disease were carried out by the use of transfer charms and amulets. The belief that the fertility spirit of the harvest resided in the last sheaf of corn harvested was applied to the protection of the farm animals. The stacks of corn in the sheaf were carefully made into figures called by such regional names as the *corn-maiden, cailleach* and *clyack* in Scotland, and in England *kern-dolly, mare* and *neck*. They were taken back to the farm and kept until New Year's morning

or, in some districts, until Hallowe'en, when they were distributed among the beasts in the belief that the influence of the harvest spirit would be passed on and so preserve them from sickness and disease throughout the remainder of the year. The specimen shown in Fig. 1, made in 1893 from the last sheaf of oats and ornamented with a piece of wallpaper and ribbons, was hung in the farmhouse of Tomnavey, Glengarm, Aberdeenshire.

Prehistoric weapons such as bronze axes, spear-heads and flint arrow-barbs, naturally-perforated stones and quartz pebbles, were used in a variety of forms. The virtues ascribed to these objects derived from mistaken ideas regarding their origin. The uniformity in shape and size, their comparative rarity and the fact that they were always found in the ground led people to believe them to be thunderbolts, and consequently endowed with supernatural powers.

A representative selection of these charm stones is shown in Fig. 2. A rough disc of yellow flint 2¾ inches in diameter (No. 90) was hung up in a byre at Slains, Aberdeenshire, to cure murrain. A naturally-perforated greenstone pebble (No. 21) was used in a byre in Cumbernauld, Dumbartonshire, to protect cattle from disease; and similarly, a green sandstone pebble (No. 29) with two perforations and the name William H. Scott scratched on one face, was hung up in a Dumfriesshire cow byre. The dark red heart-shaped stone (No. 73) and a pebble of mottled serpentine (No. 91) were both used in the Shetlands to cure and protect the animals. The crystal ball shown in Fig. 2 called the *Clach-na-Brataich*, or stone of the standard, was used for "stopping the progress of an unaccountable mortality amongst cattle". When last used, about 1830, this stone was dipped by the chief of the Clan Donnachaidh of Struan, Perthshire, in a "china bowl filled with water from a 'fairy spring', after which the water was distributed to a number of people who had come great distances to obtain it".

Sympathetic magic

In the examples considered, the fundamental action is that of transfer of a disease by contact or sympathy. The underlying reasons for this belief are based on the hypothesis that, although the heart or other portion of one animal may, to all appearance, be severed from another diseased animal, yet there is a subtle physical connection between the one and the other. If, then, the heart of a diseased animal is buried, the disease will decline and disappear with the decay and dissolution of the heart. The supernatural curative and protective virtues possessed by one object could in much the same way be transferred to another directly by touch, and indirectly, as in the case of "charm-stones", by dipping them in water and giving this water as a drench to the diseased animals.

The efficacy of these charm cures was probably governed more by the laws of coincidence than anything else. A failure could be attributed to a great many factors, such as the omission of an important detail in the ceremony, the wrong chant or the wrong kind of water, and so on. On the other hand, should the animal by chance or through stamina recover, the recovery would be ascribed to the charm and thus the charm would become firmly established.

Month in the Forest

J. D. U. Ward

Loading timber—Values—Trees and pests—Locust tree

Some four to eight weeks after young trees have been planted, it is advisable to walk systematically round them to "firm" them thoroughly by treading or heeling. And this job will probably need to be repeated later in the winter if severe weather has caused frost-lift. In a nursery, with very young plants, frost-lift can be extremely mischievous; transplants may seem almost to have been spewed out of the ground!

In a Forestry Commission wood the other day I chanced upon a gang loading larch and could not resist the temptation to stand and stare, though the operation is ordinary enough. A lorry, with a permanently-mounted crane or hoist behind its cab, was waiting in a clearing, while a tractor "tushed" the felled trees to its sides. There the sticks were measured, sawn by hand to the required lengths and loaded by the hoist, all with the greatest ease and efficiency. Compared with the technique of parbuckling (which entails rolling the logs in a chain sling, hauled by horses or tractor, up a ramp placed slanting from the ground to the lorry's deck), the modern method was almost child's play. It was also very much quicker and required far less space than parbuckling.

People working continually with timber are likely to have at least a slight idea of its value, but occasionally one hears some fantastic tale which gives the lie to this suggestion. For example, an old walnut butt found to be an obstructive nuisance at a veterinary establishment was given away "for the moving of it", when it was worth £40. And a research man told me recently that a Scottish landowner, showing him some grand larch of almost unique quality and dimensions, had proudly said, "A timber merchant once offered me £25 each for these trees". They were, said my informant, certainly worth over £75 each. Now an anecdote of this kind is likely to give a false impression, and I must add that only an unusually good larch is likely to be worth £25, and then you might have to travel a long way to find it: even £10 may be a fair price for good, above-the-average specimens of other kinds of trees. Indeed, it is obvious that many trees, and often of the large hedgerow type, have in them so little milling timber of value, and so much lop and top that can only be sawn up into firewood, that they barely pay for felling and clearing. But this is a tricky, and sometimes tender, subject.

The Forestry Commission's recent Bulletin *Exotic Forest Trees in Great Britain* is a fascinating production. But one or two sentences that caught my eye merit a mention here: "*Prunus serotina* has been used in Holland as a shelter-belt tree; it has however been found that it is an alternate host of *Myzus persicae*, an aphid-carrier of a virus disease of sugar beet. Hence its planting in Britain is to be discouraged." There are not, I think, many known

relationships of pests that spend part of their life on a tree or shrub and part on a farm crop. The most famous, or rather infamous, example is undoubtedly the rust which moves from barbary to wheat. And there is, of course, the case of spindleberry, beans and black fly, and the disease that moves between Weymouth pine and black currants. And is there any justification for being suspicious about big bud in black currants and hazel and birch?

Many may think that, economically, the most damaging mischief of this biological kind exists on a slightly different plane. It could be suggested that birds which are a nuisance to farm crops too often find a refuge in the woods, or convenient encouragement from hedgerow trees; and incidentally what about foxes? However, this is delicate ground, for there are a great many sentimentalists who care, and possibly know, far more about birds than they do about forestry or farming; and in any case, hedgerow trees have become a kind of fetish with "country-lovers".

December usually brings heavy casualties to Christmas trees and to holly, which is mercilessly lopped by thieves. It is worth observing, in this allegedly tree-loving country, how brutally trees are treated. Before November 5th every year great living branches are torn off to make bonfires, and in spring, willows, wild cherries and crab-apples are despoiled for their catkins and other blossom. Many summer picnickers think the roots and base of a large tree make the ideal place to light a fire, and vandals delight in carving their initials on the bark of the best available specimens—beech being their first favourite. Efforts in some quarters to associate schoolchildren with the work of planting and tending "council" trees are certainly an educational step in the right direction.

A correspondent in a recent issue of the *Quarterly Journal of Forestry*, looking back more than a century, was impressed by William Cobbett's commendation of the locust or false-acacia tree (*Robinia pseudacacia*), which he thought should be more widely grown and would displace even oak for many uses, from wheel-spokes to fence posts. The short answer is that the tree (out of which Cobbett himself made a great deal of money by edging into the nursery business) did not live up to its promise. It is an American species which seems to need more sun than we normally have in England; also, there appear to be two kinds—the better, mast form and a poorer one which is the more commonly seen in this country. Incidentally, Cobbett did not introduce these trees: Kew had specimens long before his time. Nonetheless, the locust tree is an interesting and often picturesque specimen, and, being a legume, is also a nitrogen-fixer. A very few towns (notably Bath and Swindon) have avenues of locust trees, where their beauty can be seen to advantage.

Farming Affairs

Pig industry development

The Pig Industry Development Authority for Great Britain, which was set up under the provisions of the Agriculture Act, 1957, held its first meeting in London on 2nd October. All sections of the pig industry—commercial pig farmers, pig breeders, bacon curers, pork butchers, pigmeat manufacturers and workers—are represented, and the Authority can, therefore, command within itself a wide fund of knowledge and experience.

In the words of Sir Archibald Nye, the Chairman of P.I.D.A., the Act enables the Authority "to carry out services for the benefit of the whole industry which will enable us to tackle anything needed to improve efficiency in producing pigs, processing them and marketing the products (apart from the actual marketing of pigs and pig products by the Authority itself, which is statute barred)".

Three of the Authority's earliest tasks will probably be the taking over from the agricultural Departments of pig recording schemes, supervising the work of pig progeny testing stations carried out by the National Pig Progeny Testing Board, and introducing an accredited herds scheme. Later, the Authority will concern itself with the potentialities of artificial insemination, the coordination and financing of suitable research, including consumer research, and the promotion of advertising and sales.

The work of the National Pig Progeny Testing Board, which will be supervised by P.I.D.A., is under way. Selby, Yorkshire, the first of the five stations which the Board will operate, was opened by the Minister of Agriculture on 26th July. Testing stations at Letchworth, Herts, Corsham, Wilts, and at Sealand, Flintshire, are nearly completed, and the Scottish station in Stirling will probably be opened next summer.

Talking about poultry

Arising from last month's notes on egg size, there have been several queries as to how long it should take before a flock reaches "standard" eggs. In my experience, a flock should give at least 60 per cent of "standards" after six to eight weeks of lay. Now this obviously depends upon the breeding behind the bird and, what is more important, the rate at which she comes into lay. In other words, it is broadly correct to say that the faster the egg production rises the longer it will take to reach a given egg size. As modern housing conditions all tend to bring the pullet into lay quickly, we may have to think more about this problem in the future. Referring again to November's notes, there is no doubt that the practice of hatching three times a year is going to help with this egg size business. It does mean that only one-third of the flock is producing small eggs at any given time.

A word about table birds. Where only a few are kept, the main problem is when to kill, especially when we have a warm and humid Christmas. Birds

will keep a week in normal weather if two simple rules are followed. Firstly, do not feed for twenty-four hours before killing, but allow a little water if necessary; and secondly, after killing and plucking, cool the carcass quickly. The danger spot on large Christmas carcasses is the back and thighs where the heat holds. Don't, therefore, pile birds in a heap of warm bodies after plucking. The best way of cooling a small number of birds is to place each carcass on its back on a cold stone or concrete floor and the heat will disperse rapidly. The carcasses may then be stored on a clean shelf so that air is free to circulate round them. If the intestines are empty and the carcass is quickly cooled, "greening"—which causes so much trouble—will be avoided.

Progeny Testing Stations now have their breeding pen birds producing at around 60 per cent. Shell texture is good and size is coming up well. It is most encouraging to see that entries—on a voluntary basis—show a definite increase for the 1958–59 season. Speaking from the Director's angle, the fact that we started at only just over half load of entries has been a blessing in this first year, and a steady increase in numbers will certainly ease the problems of staffing and management that arise. The cockerels for "on station" breeding will be arriving later this month and arrangements for isolation and testing are being made to avoid the possible introduction of disease. Perhaps I might mention here that as all three Progeny Testing farms are fairly exposed, the Directors are hoping that these birds will have been dubbed by the breeder before dispatch.

C. T. Riley

At the Farmers' Club

Agriculture and the Free Trade Area

The controversial issues involved in freeing European trade in agricultural products were defined and analysed by Mr. E. M. H. Lloyd, C.B., C.M.G., in his paper to the Farmers' Club on November 6. Remarking that we need to be clear what we mean when we talk about a Free Trade Area and a European Common Market, Mr. Lloyd explained that although both imply free trade between members, in a free trade area members retain their separate customs duties against other countries, whereas in a customs union, to which the term "common market" is usually applied, members operate an agreed tariff against outsiders.

In the Benelux customs union, formed between Belgium, the Netherlands and Luxemburg in 1948, unrestricted free trade has not yet been established between the Netherlands and her partners. In the Organization for European Economic Co-operation (OEEC), conflicting views are held by members on the position of agriculture in relation to the free trade area which OEEC is seeking to associate with the larger customs union—the European Economic Community—recently formed between Benelux, France, Germany and Italy.

Most OEEC countries would like to include all types of goods in the free trade area, but they admit that special arrangements might have to be made for agricultural products. Even within the six-nation customs union, the intention appears to be a *regulated* rather than a *free* market for these goods. Mr. Lloyd made it perfectly clear why Britain could not even contemplate joining the customs union: "We should," he said, "be abandoning our present system, under which about two-thirds of our food imports come in duty free,

and substituting a system under which Commonwealth and extra-European food imports would be taxed at a high rate; only European foodstuffs, comprising about 20 per cent of our total food imports, would come in duty free."

What the Government has rejected is the proposal to treat agricultural products in the same way as industrial ones, in a free trade area. This would conflict with the policy of protecting home agriculture and would enable European farmers to share the preference now enjoyed by Commonwealth farmers. The position might be changed if at a later date the Commonwealth countries themselves wished to become associated with the European free trade area to obtain readier access to Continental markets for their wheat, dairy products, meat and fruit. But at present there seems little prospect that European countries would be prepared to open their markets to these goods. Within the six-nation customs union, import and export of fruit and vegetables are regulated by reference to minimum prices, and no country, not even Denmark, allows unrestricted imports.

However, though free trade in the sense proposed for industry seems to be generally unacceptable, and probably impracticable, for agriculture, the OEEC is trying hard to find more ways of solving the problems of agricultural trade and production, for they cannot be ignored.

The problem is not solely commercial. An underlying factor is the existence of methods of price support which create surpluses that can only be disposed of by selling abroad at prices below those ruling on the home market. The long-term issue is the coordination of internal domestic policies, particularly the measures adopted for regulating farm prices and maintaining farm incomes.

Mr. Lloyd suggested that an agreed objective would be "not free trade but freer and fairer trade", to be achieved by reduction of excessive protection and renunciation of the practice of dumping and subsidized exports. This might in turn call for a reduction in subsidies for uneconomically high-cost production.

For the United Kingdom, this might involve a gradual reduction in the subsidies for wheat, milk, pigs and eggs. If an industrial free trade area is established, and the standard of living continues to rise, Mr. Lloyd considered that there is good reason to expect continuing expansion of Continental, as well as Commonwealth, exports to Britain.

Sylvia Laverton

Tractor sense

A tractor in *good fettle* can begin its job as soon as it has received the routine morning maintenance, and can continue working until the driver goes home in the evening. At this time of the year that means that part of its work is done in the dark. The lighting outfit supplied with most makes of tractor gives adequate illumination for road work and to satisfy the statutory requirements. When a wide trailer is being towed, however, the rear lights must be on the back of the trailer; if the trailer is very much wider than the tractor (and it usually is), additional side lamps must be fixed to the trailer itself, or to extension brackets fixed to the tractor, so that drivers of oncoming vehicles can see the overall width of the outfit.

All the usual considerations of courtesy for other road-users apply to tractor drivers on the road in the dark, and if the front lamps have no dipping device they should be directed well downwards and towards the verge of the road on the near side. A long-distance, horizontal beam is not necessary for the speeds of travel at which a tractor should be driven.

Lights that are correct for the highway are just about right for a tractor on haulage work within the farm fields. For heavy cultivating and most of the other jobs likely to be undertaken in the dead of winter, it is advisable to adjust the reflector of one of the front lamps to give a wide beam on the work just in front of the tractor. The lighting needed for ploughing at night is more complicated, because there must be a lamp shining back on to the plough, and more accurate setting of the front lamps is necessary; it is worth while remembering this when the lamps are being prepared for general winter work, in case the tractor has to be used at night during the spring ploughing. Bad weather in March can reduce daylight ploughing time and make night ploughing essential. Fortunately, this emergency arises only once every few years, but when it does occur it is as well not to have to spend time in preparing the lamps.

A good place for the rear white lamp is on a bracket behind the driving seat; experiment will show the best angle at which to fix it for lighting up the plough to advantage. The height of the front lamps should be decided upon by a trial in darkness. Connect the lamps to the lighting set by flexible wires and mount them loosely. Put the tractor and plough into a field that has plough furrows. It will soon be found that one of the lamps must be set higher than the other. However, the difference must not be too great, because if a lamp is carried too high, it has to be pointed steeply downwards to light the ground immediately in front, and the steep angle of the rays will illumine the ground too evenly and give a flat lighting. On the other hand, much of the light from a lamp that is set too near the ground shines upwards and does not penetrate to distant parts of the field. The lamps must throw into relief the outline of the furrow immediately ahead of the tractor, and at the same time shed some light ahead so that the driver can see when he is coming towards the end of the bout.

When the best positions for the lamps have been decided, mark them on the tractor and in the morning the necessary brackets can be made. The bolt holes in the brackets should be large enough to provide some latitude for movement and for small alterations to be made again in the dark when the time comes for night ploughing to be done.

Prepare some white pegs, or sticks with reflecting discs on them, to serve as a guide for the driver to get back into the furrow from the headland. He will have to get off the tractor from time to time to put the pegs into new positions, but this will give him an opportunity to look at the plough and adjust it if necessary. If only a single, white lamp is used at the back, it may illuminate the top of the implement very clearly, but usually the coulters and shares are too deep in the shadow thrown by the upper members of the frame of the plough to be seen well enough by the driver for him to make all adjustments while the outfit is moving. For ploughing, and indeed for all tractor work after dark, carry a good powerful electric torch.

H. J. Hine

In Brief

REARING PIGLETS ARTIFICIALLY

Scientists have been looking at some of the dangers and disadvantages inherent in the natural rearing of piglets—lack of milk (especially in the later part of the sow's lactation), deficiency in some essential nutrient such as iron, loss of the litter if the mother dies, and so on. Artificial rearing, says Dr. R. Braude of the National Institute for Research in Dairying, may be regarded as taking pigs away from their mother when they are 1-2 days old, feeding them on liquid milk substitutes in strictly controlled environmental conditions, and gradually bringing them on to solid food so that by the 14th day they are completely on dry feeding.

Although this kind of rearing can be carried out satisfactorily under laboratory conditions, there are, he says, still some difficulties to be surmounted before it can be adopted by pig-keepers. So far the chances of success with artificial rearing under practical conditions cannot be rated at more than 50 per cent, but doubtless considerable progress will be made within the next few years.

THE LANGUAGE BARRIER

With the International Fertilizer Congress at Heidelberg and the International Congress on Crop Protection at Hamburg uppermost in mind, the November issue of *World Crops* makes a plea for a world language. "We would suggest," says their editorial, "that with the rapid advance of science and technology there is an urgent need for an international language to be taught in every school in the world in order to destroy the language barrier and so ensure steady progress in all countries. *The gap between the more advanced countries and the poorer countries is widening and the language barrier is largely responsible.*

"This is a subject which has been studiously avoided by the United Nations, but sooner or later it will have to be tackled. The problem is urgent because it will obviously take ten years before it can even begin to take effect, but a start must be made if the story of Babel is not to be repeated in our time.

"International recognition for a single world language will mean that fewer languages need be learned and the change-over will be no more impossible than the proposed change from the inch to the metric system. It is advised that during the period of general education, only the mother tongue and the world language should be taught."

WORLD FOOD WARNING

The Director-General of F.A.O., Mr. B. R. Sen, speaking at the F.A.O. Conference in Rome in November warned member nations that the world's agricultural production has reached a stage which, if not successfully surmounted, might result in some setback in the progress achieved since the Second World War.

There is a danger, he said, that the steady rate of expansion—both in production and consumption—will be slowed down by the scarcity of investment resources, by some general pause in economic advance, and by the fall in agricultural commodity prices relative to those of other goods, which affects the lot of farmers in their capacities as both producers and consumers.

Such a slowing-down in the rate of improvement would be a serious matter at

a time when inadequate and unbalanced diets are still the common lot of more than half of the world's population.

The Director-General advanced four basic themes the discussion of which should, he said, "help to shape our work" of eradicating poverty through making possible higher incomes for the world's peoples. These themes dealt with the approach to economic development, the need for a fair assurance of stability, the evolution of a code of international ethics in economic affairs, and the need to improve extension services and nutrition policies.

This is an interesting postscript to the F.A.O. Report published in September, about which Mr. G. Ordish writes on pages 448-53.

DATE STAMPING OF EGGS

County branches of the National Farmers' Union were invited to express their views on the stamping of eggs, either in clear or code date. Replies were received from thirty-six branches. Of these, twenty-three indicated their opposition to any form of date stamping and the remainder expressed their approval of some form of date stamping.

In view of this result, the N.F.U. Committee naturally agreed not to support the dating of eggs in any form.

They decided to request the Egg Marketing Board to give urgent consideration to the question of the sale of eggs in sealed cartons and the possibility of making use of them in some way as a medium through which some indication of the age could be given.

British Farmer

CREDIT AND THE FARMER

Agricultural borrowing is at its peak at harvest time, and in August, 1955, it stood at the record figure for bank advances of just under £240m. The excellent harvest that year helped to reduce it; but the two ensuing seasons have pushed borrowing up again, and in August this year the total was only £12m. below the level of 1955.

Bank advances to agriculture are not the whole story. They are symptomatic of borrowing in other directions. When they rise, it does not mean that farmers are paying their merchants' bills; it is a fair inference that the reverse is happening, that credit is lengthening in those quarters also. Consequently, when a country bank manager tries to carry out the instructions of his head office, he can be confident that by restricting credit on one account, he will be extending it on another.

Financial Times

THOMAS BAXTER PRIZE

The 1957 Thomas Baxter Prize has been awarded to Dr. A. W. Stableforth, Director of the Ministry's Veterinary Research Laboratories since 1950.

This prize, which carries the Thomas Baxter Trophy, a gold medal and £100, was instituted in 1949, and is given annually for outstanding achievement in some particular aspect of milk production. By making this award, the Selection Committee, headed by Earl De La Warr, has obviously sought to acknowledge the indefatigable work of Dr. Stableforth in the unremitting struggle against contagious mastitis and contagious abortion in the world's dairy herds.

CHAMPIONS OF GREAT BRITAIN

At the National Ploughing Match held on 6-7th November in Scotland, Mr. John Dixon of Billingham, Co. Durham and Mr. T. L. Godwin of Hereford became Champions of Great Britain and will thus represent Britain in the World Ploughing Contest in Germany next October.

THE MINISTRY'S PUBLICATIONS

Since the list printed in the September 1957 issue of AGRICULTURE (p. 304), the undermentioned publications have been issued.

MAJOR PUBLICATIONS

Copies are obtainable at the prices quoted from Government Bookshops or through any bookseller.

BULLETINS

No. 9 Beekeeping (*Revised August 1957*) 2*s.* (2*s.* 2*d.* by post)
No. 94 Potatoes (*Revised July 1957*) 3*s.* 6*d.* (3*s.* 10*d.* by post)
No. 147 Electric Fencing (*Revised June 1957*) 3*s.* (3*s.* 4*d.* by post)

OTHER PUBLICATIONS

At the Farmer's Service (*Revised September 1957*) free

LEAFLETS

Up to six single copies of Advisory and Animal Health Leaflets may be obtained free on application to the Ministry (Publications), Soho Square, London, W.1. Copies beyond this limit must be purchased from Government Bookshops, price 3d. each (5d. by post) and 2d. (4d. by post) respectively.

ADVISORY LEAFLETS

No. 225 Cutworms (*Revised September 1957*)
No. 279 Skin Spot and Silver Scurf of Potatoes (*Revised August 1957*)
No. 349 Spring Cabbage (*Revised August 1957*)
No. 401 Windrow Harvesting (*Revised July 1957*)
No. 457 Dredge and Other Mixed Corn (*New September 1957*)
No. 458 Soft Cheese (*New September 1957*)
No. 461 Stem and Bulb Eelworm on Tulips (*New July 1957*)

ANIMAL HEALTH LEAFLETS

No. 1 Piglet Anaemia (*Revised September 1957*)
No. 22 Worms in Poultry (*Revised July 1957*)

FIXED EQUIPMENT OF THE FARM LEAFLETS

No. 13 The Cattle Crush (*Revised July 1957*) 6*d.* (8*d.* by post)
No. 30 The Farm Workshop (*New August 1957*) 1*s.* (1*s.* 2*d.* by post)

FREE ISSUES

Obtainable only from the Ministry (Publications), Soho Square, London, W.1.

FARMING TOPICS LEAFLETS

No. 14 Progeny Testing of Poultry (*New September 1957*)

MISCELLANEOUS

Agricultural Science and the Farmer (*New September 1957*)
Crop Protection Products Approval Scheme—Approved List, 1957 (*Revised 1957*)
Farm Safety Regulations: Explanatory Note—
Power Take-off (*New October 1957*)
Ladders (*New October 1957*)
Full-time Agricultural Education in England and Wales (*Revised July 1957*)

Book Reviews

The World of the Soil. (New Naturalist Series.) SIR E. JOHN RUSSELL. Collins. 25*s*.

The aim of the New Naturalist series is to interest the general reader in wild life. This book reveals that the soil is indeed a world, with a particularly complicated wild life. The more the soil is studied, the more complex it is seen to be, and so the results of its study have tended to accumulate into many specialized bodies of knowledge, such as soil chemistry or soil microbiology, each comprising many subspecializations (for example, nitrogen in soil, soil fungi, etc.), each of which is generally too large to be assimilated in detail by one brain in one lifetime.

From among these fragmented bodies of knowledge, the author has selected material to give the general reader as rounded an outline of this extremely complex world of the soil as anyone could give in, or expect from, one small book. The matter is lucidly presented, contains a minimum of technicalities and is very readable.

Having explained the mineral skeleton of the soil and how it is formed from parent rock, Sir John describes the organic material accumulated from residues of animals and plants, the great diversity of habitats the soil offers, and its air, water, temperature and acidity conditions. A corresponding great variety of organisms, visible and microscopic, lead their lives in the soil and have a significant bearing on human life.

For centuries, man has intervened in the soil world by applying fertilizers and other chemicals and by the use of practices such as tillage and drainage. Although much is now known of the way in which this intervention affects soil properties and the growth of plants, relatively little has been learned of its effects on the soil inhabitants. Nevertheless, it is clear that considerable changes of various sorts do take place: for instance, it is well known that on liming an acid soil, some species of soil organisms may disappear, while others multiply.

Sir John sees that existence is, to put it mildly, an odd thing, and in this book also there is much curious knowledge concerning history and development: often we see old practices set against their modern counterparts, or even remaining unchanged until modern times. He tells how, for instance, in 1915 he engaged a gang to chalk one of the Rothamsted fields; they did it in exactly the same way that Pliny described it in the first century A.D.

Here is a book which can be recommended unreservedly to all who are interested in the primary wealth of mankind—the soil. Sir John writes as he speaks, entertainingly and in sure command of his subject.

W.D.B.

Types of Rural Economy: Studies in World Agriculture. RENÉ DUMONT. Methuen. 45*s*.

This is an intriguing book, full of fascinating details. It is a series of case studies of individual farms in different parts of the world, from the Belgian Congo in the south to England in the north and across to the east as far as northern Vietnam. These case studies represent types of farming common to the different countries or regions. The author does not try to use them as a reflection of the more usual farming systems or most common problem, but only as a means by which the differing patterns of farming throughout much of the world can be shown. A vivid picture of the contrast between backward, poor farms as against progressive ones is painted in terms of the lives farmers and farm workers actually live and the work they actually do. For example, in England the case studies are drawn from a small area north-west of Ludlow, but out of them is woven a kaleidoscope of English farming practice and policy since 1939.

Even if case studies are brilliantly described, they remain isolated and ineffective if the matrix in which they are embedded does not have purpose and clarity. It is here where René Dumont's book is weakest. The argument is rather disjointed

and diffuse. However, certain basic problems are brought out clearly. These include the difficulties of farms which are too small, the essential wrongness of extensive farming on good land combined with over-intensive use of poor land, the benefits of farm mechanization, the pressure of population on rural land use in some areas, and the poverty of heavily-agrarian countries or regions.

The book will be of particular use to students of agriculture in countries where there is little local agricultural literature. The author's personal experience of the farms he describes, coupled with the strong independence of his thinking and writing, gives vividness to his style, and this has been held by the excellence of the translation. And how refreshing it is to have these local and national agricultural problems discussed by a Frenchman, for a change, rather than by a Briton or American!

G.P.W.

Proceedings of the British Society of Animal Production, 1957. Edited by I. L. MASON and G. WIENER. Oliver and Boyd. 15*s*.

The 1957 volume of the *Proceedings of the British Society of Animal Production* includes nine articles, two of which were presented as papers at the 1956 summer meeting of the Society held at Belfast and, appropriately, deal with livestock production and marketing in Northern Ireland.

A study of the end products of normal ruminant digestion and bacterial breakdown, and the efficiency of their subsequent utilization and assimilation by the animal, is reported by Armstrong, Blaxter and Graham. It is shown that the major end products of bacterial digestion of cellulose, the steam volatile fatty acids, may be used less efficiently by the ruminant animal than the normally-accepted feeding standards would indicate, and the degree of efficiency is markedly influenced by the amount and quality of the ration fed to the animal.

Nicholson and Smith report upon a three-year trial dealing with the autumn management of spring-born beef calves. It was found that calves put in yards immediately after weaning were not subject to the reduced liveweight gain (or even loss of weight) incurred by calves which had been grazed for two months before yarding. Of scientific and practical interest is the account of hexoestral implantation carried out on three different age groups of sheep. In sucking and weaned lambs subjected to hormonal treatment there was an increase in liveweight gain as compared with the controls, and in the case of treated draft ewes there was, in addition, improvement in carcass quality resulting from increased muscle development at the expense of fat deposition.

The other articles will also arouse considerable interest in the reader, and particularly worthy of mention is "The Heritability of Carcass Traits in British Bacon Pigs" by J. W. B. King.

J.L.H.

A Textbook of Plant Virus Diseases (Second Edition). KENNETH M. SMITH. Churchill. 65*s*.

It is probably safe to say that no book on plant viruses has been more frequently consulted by workers than the first edition of this book, which successfully evolved a system of comparison between plant viruses that was sufficiently comprehensive to serve as a work of reference. The present edition will be equally useful and popular.

It succeeds because of its simple construction and the ability of the author to dispense with polemics. Statements are made with little attempt at critical evaluation and no special pleading. In science, this attitude is not generally considered as a virtue, and even in the present work the juxtaposition, without comment, of statements of varying authenticity can be confusing. But considering the way opinions about plant viruses have changed and are changing, the method has obvious merits.

In the first edition the viruses were distinguished by numbers and were grouped under the headings of the host plants in which they were first described. This method has now been abandoned in favour of a simple alphabetical arrangement of the common names, used in the *Review of Applied Mycology* (Vol. XXXV supp. 1957, which Dr. Smith helped to prepare). The most generally accepted common names of the viruses are used as headings, with cross-references to other names, and an index of synonyms for identification. Other indexes, for instance one for plant hosts and another for vectors, would have increased the usefulness

as a textbook and nullified the effects of slight lapses which are almost unavoidable in such a mass of largely unconnected data. Searching for an example of a virus of rather obscure relationships to "run down", I had great difficulty in finding where potato "purple top wilt" virus had been placed; I located it in the text, under A for aster yellows virus, but not in the index.

The names of vectors are also sometimes confusing. The name of the leafhopper vector of alfalfa witches broom virus is given as *Orosius argentatus*, that of tomato big bud as *Thamnotettix argentata*, and that of tobacco yellow dwarf as "*Orosius argentatus* (formerly *Thamnotettix argentata*)". This would not have happened if a vector index had been constructed.

However, such fault-finding seems almost ungrateful, for this book will undoubtedly be indispensable to plant virus research workers for many years to come, and thanks rather than criticism are due to the author.

M.A.W.

Shell Nature Studies III: Fossils, Insects and Reptiles. Phoenix House. 7*s*.

I can well imagine that any young naturalist would be delighted to have this book as a Christmas present. Like its predecessors, *Flowers of the Countryside* and *Birds and Beasts*, the twelve beautifully reproduced composite paintings are wholly delightful. The artist in this instance is Mr. Tristram Hillier. The subject-matter, for which the editor, Mr. Geoffrey Grigson, has supplied the text, ranges rather inconsequentially over fossils, insects, reptiles, shells, minerals, birds' eggs and sea anemones. But what a stimulus these pages are to go out and search hedgerow, heath, coppice and sea-shore and discover for oneself the infinite variety of the wonder and beauty of nature—past and present.

There is, for example, the attractive little violet sea-snail of the Cornish coast; sea anemones, like the speckled strawberry and plumose that flaunt their inviting colours with the returning tide; among the butterflies, the Swallow-tail of the Norfolk Broads and the migratory Red Admiral; and, of our reptiles, grass snake and adder, toads, frogs and lizards. Text and colour plates merit careful study and should send readers off to find out more about their subjects. Who knows, a book such as this may well inspire an enthusiasm that could lead to a life-long hobby or even a career as an eminent naturalist.

S.R.O'H.

Take Not Our Mountain. DOROTHY CAMPION. Hale. 16*s*.

In this book we have the almost incredible story of two persons of contrasting characters who began farming under the most adverse conditions imaginable. With no previous farming experience they took possession of Nyth Bran, a derelict mountain farm of about 300 acres in the very heart of Snowdonia. They started with a bank overdraft, which was a terrible handicap in a system of farming where money comes in only about twice a year.

The story is about ex-Commando Waugh Campion, who came to this area to regain his health and with his town-bred wife Dorothy set out to find peace and happiness among conditions which at first were really primitive. Through sheer persistency, unbounded faith, resolution and, above all, a deep sense of humour, they rode successfully wave after wave of setbacks brought about by lack of capital, extreme weather conditions and other factors. Theirs is not a money-making project, but one that once again proves to most lovers of the land that farming is not only a means of livelihood but also a way of life.

The day-to-day and season-to-season operations and problems on sheep farms in this area are described in an easy and readable manner which will attract readers far beyond the farming community. Mrs. Campion has only a superficial knowledge of farming and some obvious technical mistakes come to light. Often she draws upon her imagination, but this adds to the entertainment, and certainly her detailed descriptions of a thunderstorm in Snowdonia, winter conditions in the area, sunrise on Snowdon, and Waugh's attachment to his dog Trigger, are realistic enough.

The book will give encouragement to those who are struggling, and impart thankfulness to those who farm under better conditions.

H.E.R.

Wrought Ironwork (Revised Edition). (R.I.B. Publication No. 55.) Rural Industries Bureau. 8*s*. 6*d*.

The main object of this book is to provide basic instruction in wrought ironwork, a craft which in recent years has regained some of its earlier popularity. It also aims at refreshing and extending the knowledge of established rural craftsmen.

A short, introductory section deals with the tools necessary for the craft, and the method of transferring line drawings on to a metal plate. In a series of fifteen lessons, Part 1 deals with the making and fixing of scrolls, twists, wavy bars and water leaves, and the square blockings for gate rails. Nine different types of scrolls, the most important feature of decorative ironwork, are described in detail. The method of making a scroll tool is wisely included.

The eighteen lessons in Part 2 fully cover the making, fitting and assembly of an ornamental gate. They succeed admirably in conveying the need for meticulous workmanship to produce a well-finished article.

A short but most useful section at the end of the book deals with the painting of wrought ironwork. Good workmanship deserves preservation, and proper painting is very essential, especially as mild steel is frequently used today and this rusts more easily than pure iron.

Two of the great merits of the book lie in its simple, straightforward style of presentation and its many excellent photographs and illustrations. It is a first-class publication and should be read by all who are interested in this ancient craft.

R.K.

Books Received

Dairy Husbandry. R. Kenney. Nelson. 12*s*. 6*d*.

Estate Capital: the Contribution of Landownership to Agricultural Finance. D. R. Denman. Allen and Unwin. 22*s*. 6*d*.

Profitable Poultry Production. (Southern Farm Series.) E. D. Parnell. Chapman and Hall (London), Wiley (New York). 40*s*.

Changing Patterns in Israel Agriculture. Haim Halperin. Routledge and Kegan Paul. 28*s*.

Exotic Forest Trees in Great Britain. (Forestry Commission Bulletin No. 30.) H.M. Stationery Office. 17*s*. 6*d*. (18*s*. 1*d*. by post).

The Study of the Soil in the Field (4th Edition). G. R. Clarke. Clarendon Press: Oxford University Press. 35*s*.

Elementary Soil and Water Engineering. G. O. Schwab, R. K. Frevert, K. K. Barnes, T. W. Edminster. Chapman and Hall (London), Wiley (New York). 50*s*.

Hill-farm Hazard. Mary Clifford. Hale. 16*s*.

The British Council Annual Report, 1956–57. 1*s*.

Rural Industries Loan Fund Limited Report for 1956–57. 2*s*.

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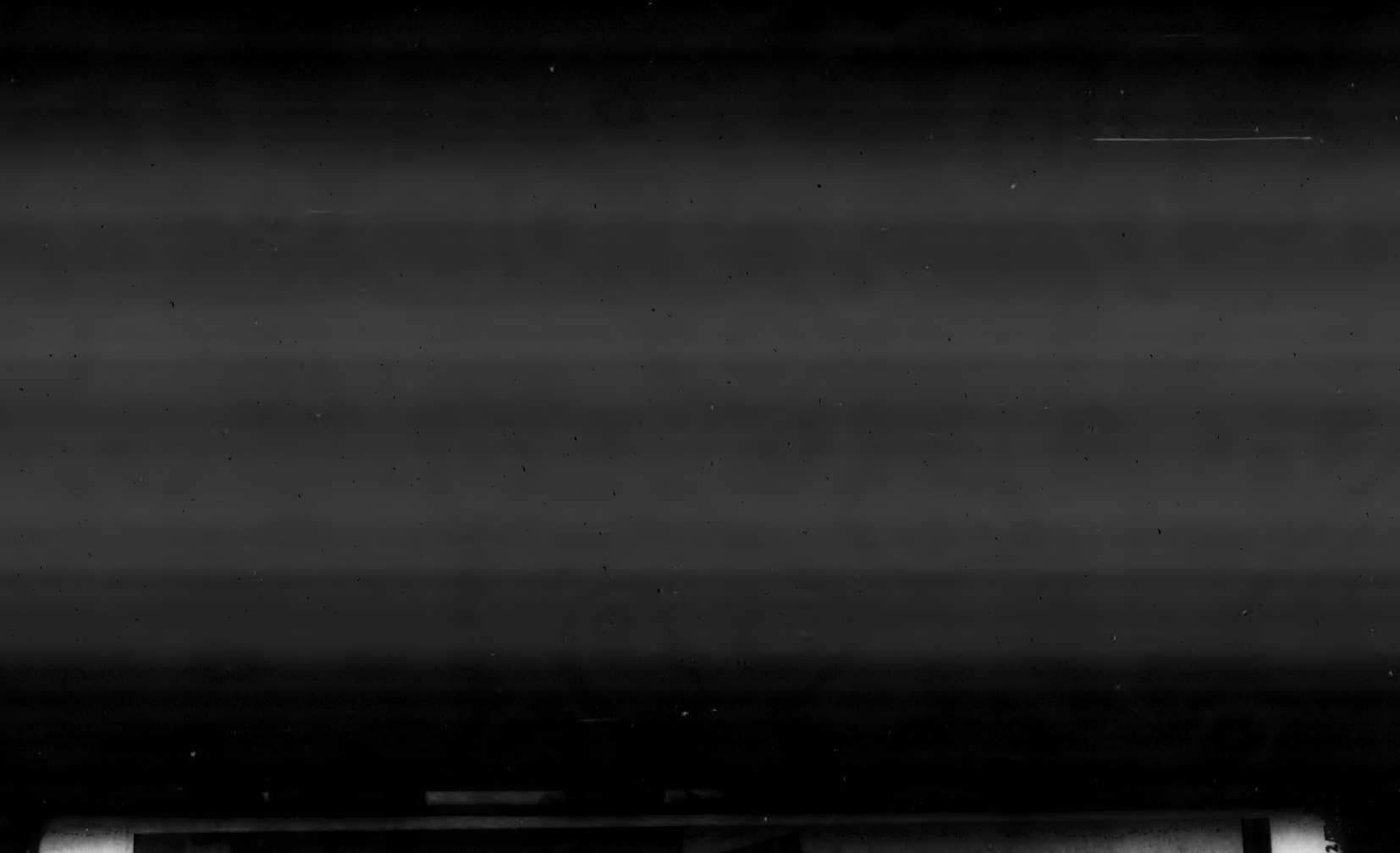
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